DOCUMENT RESUME

ED 143 793 CE 012 060

AUTHOR Nee, John G.
TITLE The Development of a Technical Conceptual Structure for the Concepts Possessed by Selected Quality Control Specialists. Report of a Research Project.
INSTITUTION Central Michigan Univ., Mount Pleasant. Dept. of Industrial Education and Technology.
PUB DATE May 77
NOTE 73p.; Best copy available; Some expenses of the project were covered by a grant from the Faculty Research and Creative Endeavors Committee at Central Michigan University

EDRS PRICE MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS *Association Tests; *Cognitive Style; Computer Programs; Concept Formation; *Conceptual Schemes; Individual Characteristics; Participant Characteristics; *Quality Control; Social Science Research; *Specialists; *Thought Processes; *Verbal Stimuli

ABSTRACT

This project had as its specific objective the development and field testing of a procedure for identifying the structure of technical concepts possessed by a group of selected quality control specialists. The associative theory of verbal behavior served as the rationale by which conceptual structures depicted by graphical maps of technical concepts possessed by the specialist were developed and validated. A sample of statistical quality control key stimulus words representing technical concepts was selected and randomly arranged to elicit continued free association responses from thirteen quality control specialists. Response data analysis procedures and analytical models were developed for structuring statistical quality control conceptual structures and depicting those structures in graphical concept maps. Computer programs necessary to facilitate data analysis techniques were developed and used. The procedural model, data gathering instrument format, and computer programs developed and utilized during the project are considered appropriate for use in developing associative conceptual structures (maps) for other technical and engineering related subject areas. The appendix includes an example of the response booklet which specialists were asked to complete, response summary sheets, final list of pooled response words, ratio of coefficients (RC) computer program, RC computational example, and a factor analysis computer program. (Author/BL)

Documents acquired by ERIC include many informal unpublished materials not available from other sources. ERIC makes every effort to obtain the best copy available. Nevertheless, items of marginal reproducibility are often encountered and this affects the quality of the microfiche and hardcopy reproductions ERIC makes available via the ERIC Document Reproduction Service (EDRS). EDRS is not responsible for the quality of the original document. Reproductions supplied by EDRS are the best that can be made from the original.

ED143793

REPORT OF A RESEARCH PROJECT:

The Development of a Technical Conceptual Structure for the Concepts Possessed by Selected Quality Control Specialists

BEST COPY AVAILABLE

by
John G. Nee

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
John G. Nee
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND THE ERIC SYSTEM CONTRACTORS."

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Department of Industrial Education and Technology
Central Michigan University
Mount Pleasant, Michigan 48859

OE 012 060

ACKNOWLEDGEMENTS

The following project is the result of considerable support and guidance from many kind and generous individuals. The assistance offered throughout the conduct of the project by Dr. Brandon B. Smith, Director of the Minnesota Research Coordinating Unit for Vocational Education at the University of Minnesota, and Mr. Bob McCreary, Quality Control Specialist at Decatur Pump Company, Decatur, Illinois will always be gratefully appreciated.

The investigator is deeply indepted to all the quality control specialists who cooperated in the collection, analysis, and review of data for the project. Without their help and the many man hours of time they spent on the project the results would not have been possible. Also, the investigator acknowledges the efforts of Dr. Emmett Mason, Professor, Department of Industrial Education and Technology, Central Michigan University; and Dr. Norman Deunk, Professor, Department of Business and Administration, Central Michigan University. Ms. Sue Johnson provided considerable help in the organization and tabulation of massive raw data, and the preparation of the EDP programs.

All of the expenses incurred during the completion of the project were covered by a grant from the Faculty Research and Creative Endeavors Committee at Central Michigan University. The investigator greatly appreciated this assistance at a time when it was certainly needed.

J.G.N.
May 1977

TABLE OF CONTENTS

	PAGE
ACKNOWLEDGEMENTS	iii
LIST OF FIGURES	v
The Problem	1
Rationale for the Procedure	3
Methodology	5
Conceptual Maps	14
Conclusions and Recommendations	19
APPENDICES	
A. Participating Quality Control Specialists	22
B. Quality Control Specialists Background	23
C. Response Booklet	24
D. Response Summary Sheets	27
E. Final List of Pooled Response Words	29
F. RC Computer Program	33
G. RC Computational Example	42
H. Factor Analysis Computer Program	43

LIST OF FIGURES

FIGURE PAGE

1. The Number of Response Words with a Frequency of One (1) and a Frequency of Two (2) or More for Selected Statistical Quality Control Key Words. 7

2. The Conceptual Structure of Key (Stimulus) Word-Concepts for a Group of Statistical Quality Control Specialists 15

The Problem

Valid curriculum content in vocational and technical education typically has been determined by advisory committees made up of on-the-job workers and/or supervisors. These committees, together with educators, attempt to identify jobs and tasks for specified occupations or clusters of occupations, and then infer the technical concepts necessary for satisfactory on-the-job performance. The occupational job/task analyses often are used for the development of goal statements/performance objectives and subsequent learning activities and teaching materials. Although the job/task analysis is subjective and often varies depending on the locale and committee membership, the process when used carefully, provides a basis for occupational curriculum development in terms of psychomotor or manipulative content.

A number of vocational-technical and practical arts researchers and teacher educators have, during the last decade, given increased attention to identifying and organizing cognitive content via determining conceptual structures or maps. Some of these educators were primarily interested in verbal learning problems and used the free association technique to assess the structure of concepts.

Mason (1969) reminded curriculum developers and taxonomy builders that their efforts in ordering knowledge, which will later become the basis for learning and related instructional activities, must result in a logical conceptual structure. The structure must contain the significant components of the cognitive content and be presented in such a way that communicates well. Curriculum developers should be

> ...concerned that the words used to express this content have face validity. It is admitted that those who classify and order esoteric knowledge appear often not to want to communicate because of the words and symbols they use, but this is due in part to their concentration on the content, and its expansion, rather than on immediate and widespread communication (Mason, 1969, p. 5).

Moss, Pucel, Smith and Pratzner (1970) summarized the problems of selecting and organizing cognitive content for technical programs when they indicated that

> Workers are observed and the specific knowledge believed to be needed to perform occupational tasks is inferred; supervisors are asked to estimate the concepts needed by satisfactory workers; or workers are asked to tell what they know. And in each case the results are biased by investigator suggestion, by perceptions of social acceptability, by lack of ability to consciously introspect or to observe, or by unrealistic occupational expectations. After subjectively identifying the cognitive competencies of the occupation (usually in the form of lists of objectives or content topics), "experts" try to logically organize and arrange content into what is hoped will be a psychologically efficient manner. Rarely do two independent attempts at analyzing occupations or organizing content ever conclude with identical or even similar results (Moss, et al., 1970, p. 71).

Because the cognitive or knowledge components of changing and/or immerging occupations are increasing, as compared to the psychomotor components, a procedure which can be used with advisory committee input to determine appropriate conceptual structures or maps appears to be most valuable.

This project had as its specific objective the development and field testing of a procedure for identifying the structure of technical concepts possessed by a group of selected quality control specialists. The associative theory of verbal behavior served as the rationale by which conceptual structures depicted by graphical maps of technical concepts possessed by the specialists were developed and validated. In order to meet this objective, the project developer identified a number of enabling objectives. The enabling objectives were to:

(1) determine an extensive but non-exhaustive list of statistical quality control words associated with selected product and process related metal working industries;

(2) develop a response booklet format suitable for use with an advisory committee made up of selected quality control specialists;

(3) formulate response data analysis procedures and identify analytical models appropriate for structuring statistical quality control conceptual structures and to depict those structures in graphical concept maps; and

(4) develop computer programs necessary to facilitate data analysis techniques suitable for use by curriculum developers and instructional technologists.

Rationale for the Procedure

The works of Nobel (1952) and Deese (1962) served as the basis for the procedure used during the conduct of this project. Both of these researchers used the theory of verbal behavior in stating that a person's cognitive domain is composed of many conceptual systems or substructures, each representing the associative relationships among individual concepts. In addition, the rationale that the project was based upon is found in the work of Garskof and Houston (1963), Johnson (1964, 1967), Mason (1969), but more specifically is related directly to the work of Moss and Pucel (1967), Smith (1968), and Pratzner (1969). All of these vocational-technical and practical arts researchers were interested in using the free association technique to assess the structure of workers' concepts. Moss, Pucel, Smith and Pratzner were concerned with the technical concept structure for various electronics technicians. These four researchers made the following statements in Report of a Seminar: Process and Techniques of Vocational Curriculum Development.

Their assumptions directly served as rationale for the procedures used during the project.

1. Occupations have bodies of knowledge which are related to quality of performance in the occupation.

2. The technical knowledge of an occupation possessed by an individual is composed of concepts, which are the psychological meanings--the understandings--of the things, processes and units of measure of that occupation.

3. Individuals organize their technical concepts into an integrated network or structure; the position of a particular concept in the structure is dependent upon its functional relationship to other concepts.

4. Terms or words can be viewed as verbal labels for underlying concepts.

5. Workers who are performing satisfactorily in an occupation have acquired the verbal tags necessary to identify their concepts.

6. The associative meaning of a concept is defined as the total free associative response distribution which a given stimulus word elicits.

7. The concepts underlying the free associative response distribution of words are located in the same psychological environment as the stimulus-word concept; that is, they are located close to the stimulus concept in the individual's conceptual structure. The responses given first represent concepts closer to the stimulus concept than the responses given later.

8. The technical vocabulary of an occupation, which identifies the technical concepts of that occupation, can be determined by repeated administrations of a free-association instrument, which is revised between each administration so as to include the new responses not previously used as stimuli. The procedure is continued until all (or at least all the representative) technical words have been identified.

9. The associative relatedness of <u>two</u> concepts, that is their psychological proximity in the structure of concepts, is determined by the relative amount of overlap between their two response distributions or associative meanings. The greater the similarity or overlap between the free response distributions to the two stimulus word concepts, and the closer they are in the conceptual structure. For example, <u>identical</u> response distributions will be obtained only from two identical stimulus word-concepts, or if two stimulus word-concepts are psychological synonyms and appear in the same conceptual associative environment.

10. The associative structure of technical concepts can be generated for an individual or a group of people by calculating a matrix of associative relatedness measures between all possible pairs of stimulus word-concepts in the technical vocabulary. The magnitude of the relatedness measure indicates the amount of overlap between the response distributions for two stimulus words, and can be viewed as an index of the psychological distance between the two stimulus word-concepts.

11. The structure of concepts revealed by the matrix of associative relatedness measures is complex and can be simplified by subjecting it to various types of multidimensional solutions to identify the higher-order, more inclusive structural concepts. Higher-order concepts are those whose associative meanings have something in common with the associative meanings of two or more other independent lower-order concepts (Moss, et al., 1970, pp. 72-74).

Methodology

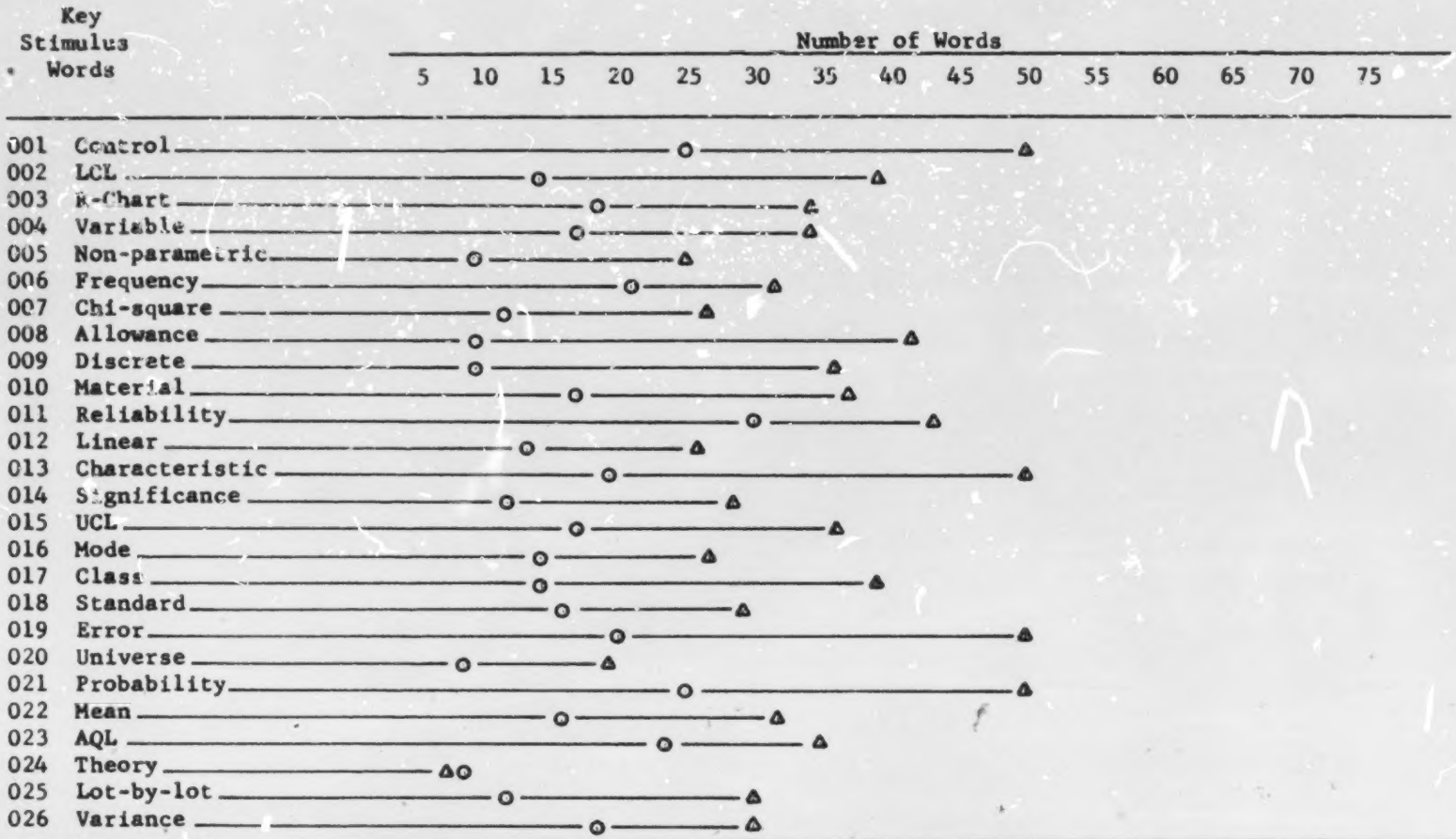
A sample of statistical quality control key stimulus words (FIGURE 1) representing technical concepts, was selected and randomly arranged to elicit continued free association responses from a small purposive sample of thirteen quality control specialists (APPENDIX A). The specialists were experts in the subject of statistical quality control and were capable of performing a broad range of quality control related tasks found in process and product related metal working industries (APPENDIX B). Each specialist was administered an identical response booklet (APPENDIX C) with instructions to respond freely with as many statistical quality control words as possible to each key stimulus word. Statistical quality control handbooks and textbooks were used to identify, with the assistance of several quality control specialists, suitable key stimulus words.

The specialists were encouraged to function as a volunteer advisory committee, but were provided a token honorarium for their efforts. The specialists were permitted, unlike the studies previously mentioned, to complete the response booklet at work or at home over a period of three weeks. The specialists were given instructions not to refer to any technical reference in completing their tasks and all willingly agreed to do so. This variation from a carefully controlled experimental environment was considered an important one, and critical if the procedure was to be used in a practical way at the local level by curriculum developers.

The procedures used by Smith (1968), Pratzner (1969) and Mason (1969) were used in organizing the response data. Individual responses to each stimulus word were transferred to response summary sheets (examples shown in APPENDICES D-1 and D-2), and the average rank order of the "coded" response frequency distribution for each stimulus word was determined. In determining this coded rank order, the response words or associates of the specialists were arranged according to the number of times they were given (maximum of 13 times), and then, within the group of words with the same frequency, according to the average rank order in which they had been given as responses to the stimulus word. Response words given by only one of the thirteen specialists were omitted from the pooled list of responses. The final pooled list of response words (APPENDIX E) was then taken as the most agreed upon response distribution of statistical quality control words. FIGURE 1 shows the number of response words or associates given to each key stimulus word.

Code numbers were assigned to each stimulus word (001-122) and to each response word or associate (200-663). The code numbers were punched on computer data processing cards, using one to four cards for each stimulus key word together with its pooled response words.

A special data processing program (APPENDIX F) was developed and modeled after the program developed by Mason (1969). The program generated an associative structure matrix of relatedness coefficients (RCs) which assessed the amount of commonality between all pairs of pooled response distributions. The relatedness coefficient developed by Garskof and Houston (1963) was used during this project because of its appropriateness for analyzing continued responses from each quality control specialist. Primarily because "...the relatedness of two words varies directly with the degree to which the associative hierarchies connected to those two words are identical." (Garskof and Houston, 1963, p. 279).



To be read: The stimulus word <u>control</u> elicited 25 response words which were given by two or more respondents and 50 idiosyncratic response words, those which were given by one respondent.

FIGURE 1

THE NUMBER OF RESPONSE WORDS WITH A FREQUENCY OF ONE (1) AND A FREQUENCY OF TWO (2) OR MORE FOR SELECTED STATISTICAL QUALITY CONTROL KEY WORDS

12

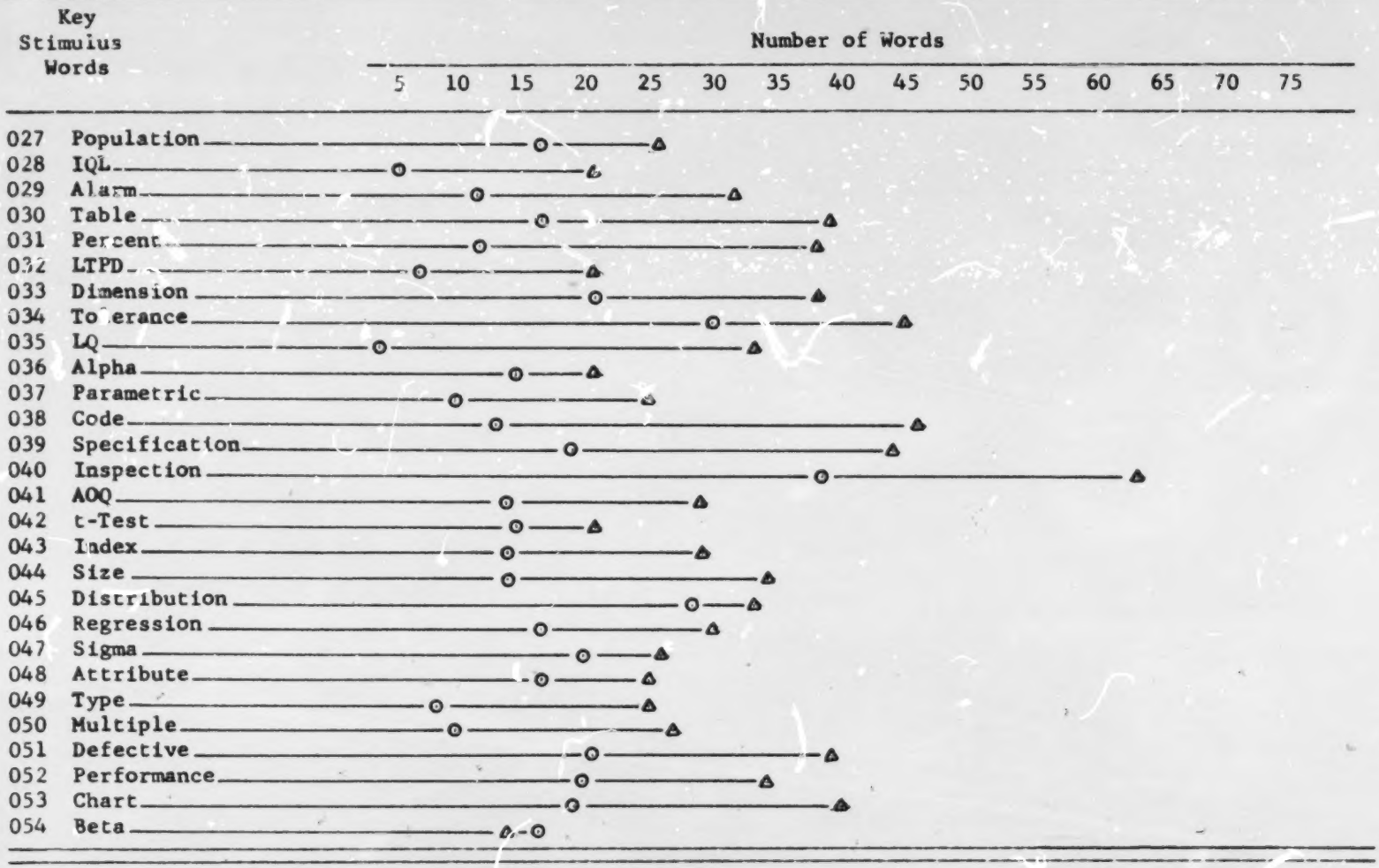


FIGURE 1 (Continued)

THE NUMBER OF RESPONSE WORDS WITH A FREQUENCY OF ONE (1) AND A FREQUENCY OF TWO (2) OR MORE FOR SELECTED STATISTICAL QUALITY CONTROL KEY WORDS

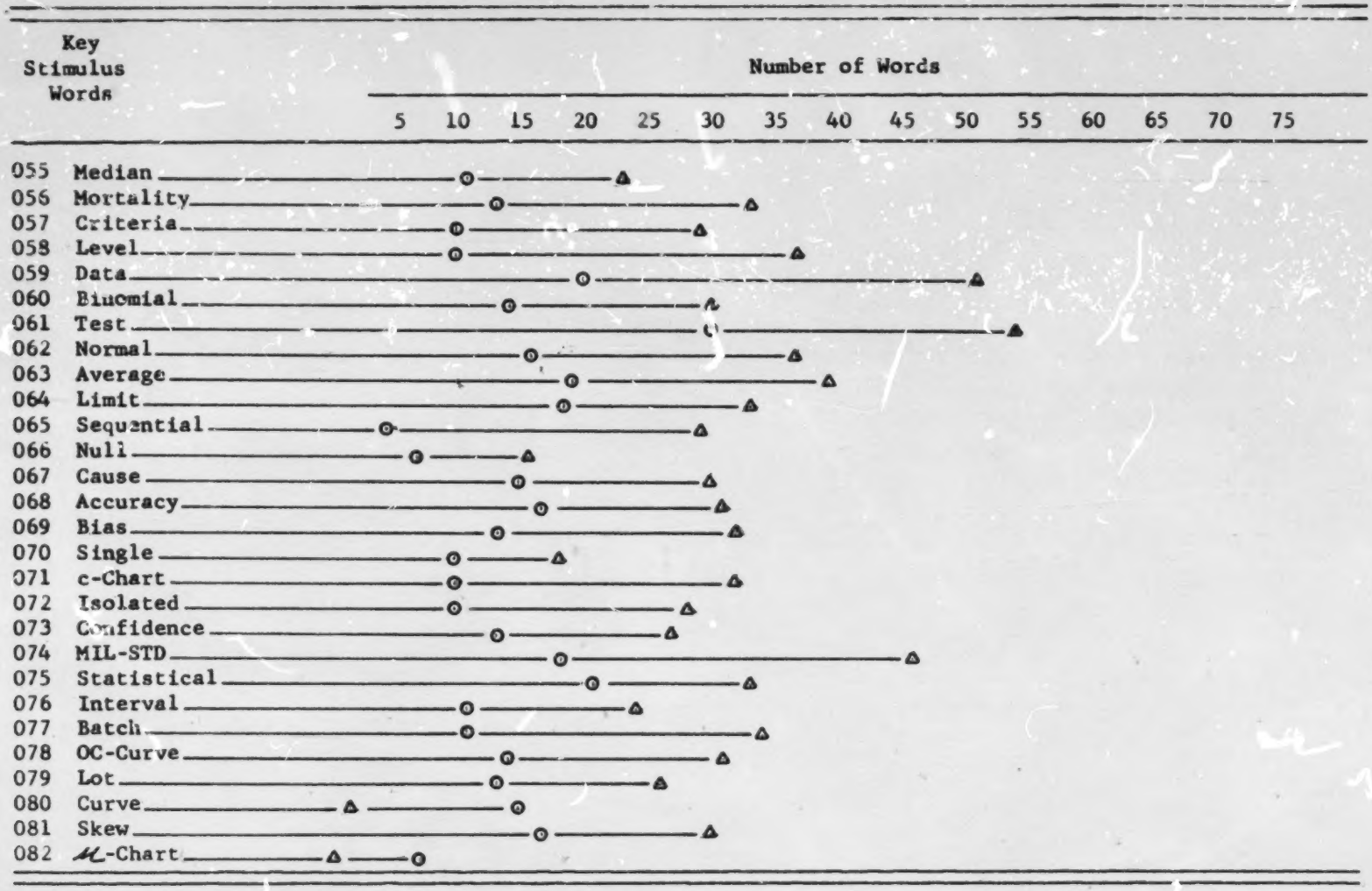


FIGURE 1 (Continued)
THE NUMBER OF RESPONSE WORDS WITH A FREQUENCY OF ONE (1) AND A FREQUENCY OF TWO (2) OR MORE FOR SELECTED STATISTICAL QUALITY CONTROL KEY WORDS

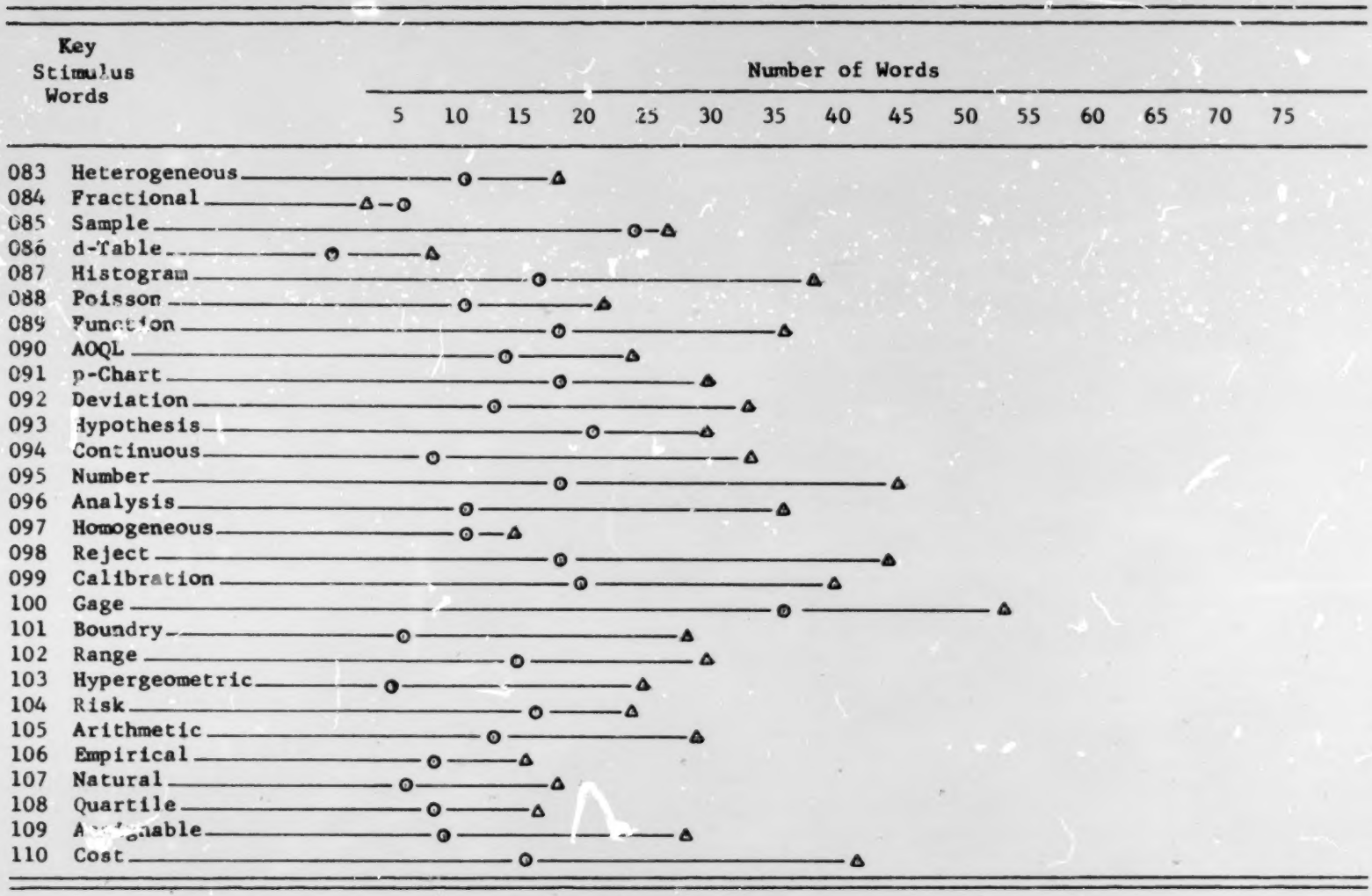


FIGURE 1 (Continued)

THE NUMBER OF RESPONSE WORDS WITH A FREQUENCY OF ONE (1) AND A FREQUENCY OF TWO (2) OR MORE FOR SELECTED STATISTICAL QUALITY CONTROL KEY WORDS

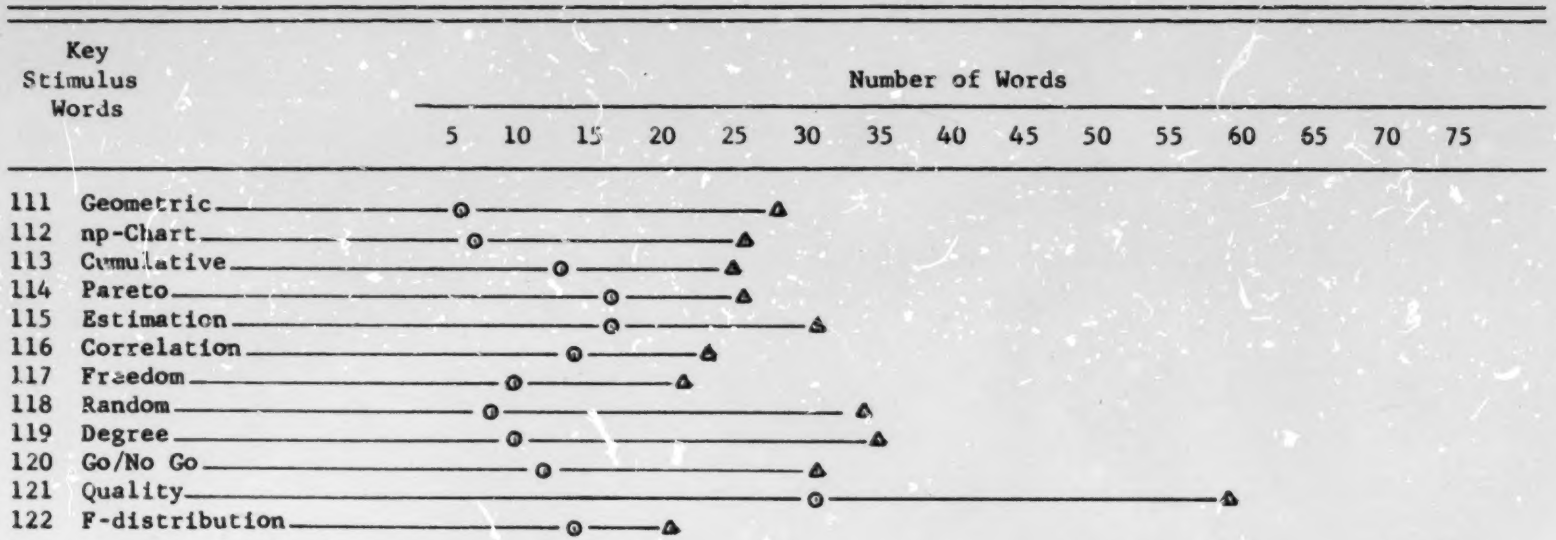


FIGURE 1 (Continued)

THE NUMBER OF RESPONSE WORDS WITH A FREQUENCY OF ONE (1) AND A FREQUENCY OF TWO (2) OR MORE FOR SELECTED STATISTICAL QUALITY CONTROL KEY WORDS

The relatedness coefficient (RC)

$$RC = \frac{\bar{A} \cdot \bar{B}}{(A \cdot B) - [n^p - (n-1)^p]^2}$$

RC is the ratio of the obtained overlap to the maximum possible overlap. It can assume values from 0 to 1.

The product (A · B) represents the intersect which would be obtained if every element in A appeared in B (and B in A) and in the same order, and $[n^p-(n-1)^p]^2$ is an expression of the difference between the product A · B and the A · B product in the case where the two stimulus words are different. A = the ranked response distribution to stimulus word A, B = the ranked response distribution to stimulus word B, $\bar{A}$ = the ranks of responses to stimulus word A which are common to stimulus word B, $\bar{B}$ = the ranks of responses to stimulus word B which are common to stimulus word A. The relatedness coefficient gives greatest weight to the first response word under the assumption that the importance of the first response in a short list of response words is at least as important as the first response in a longer list (Garskof and Houston, 1963). In the expression $[n^p-(n-1)^p]^2$, p is a weighting exponent which is controlled by stimulus, human, or situational variables. The project developer chose to use p = 1, with the rationale based on the theory proposed by Mednick (1962).

> His theory states that the highly creative individual possesses flat associative hierarchies while the low creative has steep hierarchies. Flat associative hierarchies are those in which the probability of evocation of a large number of associates are relatively equal. Steep hierarchies are those in which a few associates are extremely probable while others are quite improbable.
>
> The hypothesis [of his study] is that correlations between RC and judgement scores should be higher for high creatives when p = 1 and that correlations should be higher for low creatives when p = 2. This is based upon the notion that, in the case of an individual with a flat associative hierarchy, a close approximation to the true weighting exponent is represented by p = 1. p = 2, which gives more weight to the first emitted associates, is proposed as the appropriate value in the case of a steep hierarchy individual for whom the first emitted associates carry more of the meaning of the stimulus word (Garskof and Houston, 1963, p. 285).

APPENDIX G provides an explanation of the RC as used in this project together with a computation example based on the data presented in APPENDICES D-1 and D-2.

The calculated relatedness coefficients for all pairs of stimulus words were then put into a 122 x 122 matrix via a computer program which provided data input for factor analysis. An RC of 1.00 was used in the diagonal cells of the matrix with the assumption that each stimulus word elicites itself 100 percent of the time as a first response associate (Deese, 1962; Garskof and Houston, 1963).

A computer program (APPENDIX H) was identified and modified for use during the factor analysis procedure (principle component solution subjected to varimax rotation) in reducing the RC matrix to simple conceptual map structures. The first factor analysis solution indicated the factor loading of each stimulus word on each cluster of concepts (factor). A .300 value was selected based on the rationale used by Pratzner (1969) as a reasonable criterion value to indicate a significant factor loading. The associative meaning of each cluster was determined by pooling the associative meanings of all the stimulus word-concepts, or lower order factors, which had a significant factor loading of .300 or above on that cluster. Pratzner's study established the rationale for analysis of higher and lower order factors.

> It was considered possible for a stimulus word to be used in more than one cluster, but a stimulus word could be used only once within each cluster. The stimulus word, and its respective (pooled) associative meaning, represented the empirical base from which the (pooled) associative meaning of each technical cluster was determined.
>
> The associative meaning of a cluster was interpreted as a higher order stimulus concept, having characteristics similar to the original (lower order) stimulus word-concept associative meanings. Higher order factors were refactored by the same procedures.... This practice of refactoring was continued until the fewest possible clusters were identified, which subsumed the largest percentage of all the lower level clusters and original stimulus word-concepts (Pratzner, 1969, p. 38).

The resulting conceptual maps, found in the next section of this report, were given to selected quality control specialists for validation and for

labeling of higher order clusters in the structure for that concept group. The naming of clusters by the specialists made it possible to construct the graphical conceptual structure maps.

The numerical computations, those involving RC matrices and the factor analysis, were done by the UNIVAC 1106 computer available at the Computer Center at Central Michigan University.

Conceptual Maps

Figure 2 graphically depicts the maps of associative structures for the selected quality control specialists. Figure 2 is to be read as follows. Probability (021) had a loading of .4334 on the higher order factor. Control (001) had a loading of .5343 on one of the secondary factors and np - chart (112) had a loading of .3712 on one of the primary factors.

The stimulus words which loaded above .3000 on one or more factors are shown in Figure 2. The higher order factor had 31 stimulus words which loaded between .5360 and .3032.

Two meaningful factors occurred at the secondary level. One factor contained two stimulus words which loaded at .3798 and .3181 while the second factor had 29 stimulus words which loaded between .5343 and .3027.

Four meaningful factors occurred at the primary level. All of these had at least three stimulus words which loaded above the .3000 level.

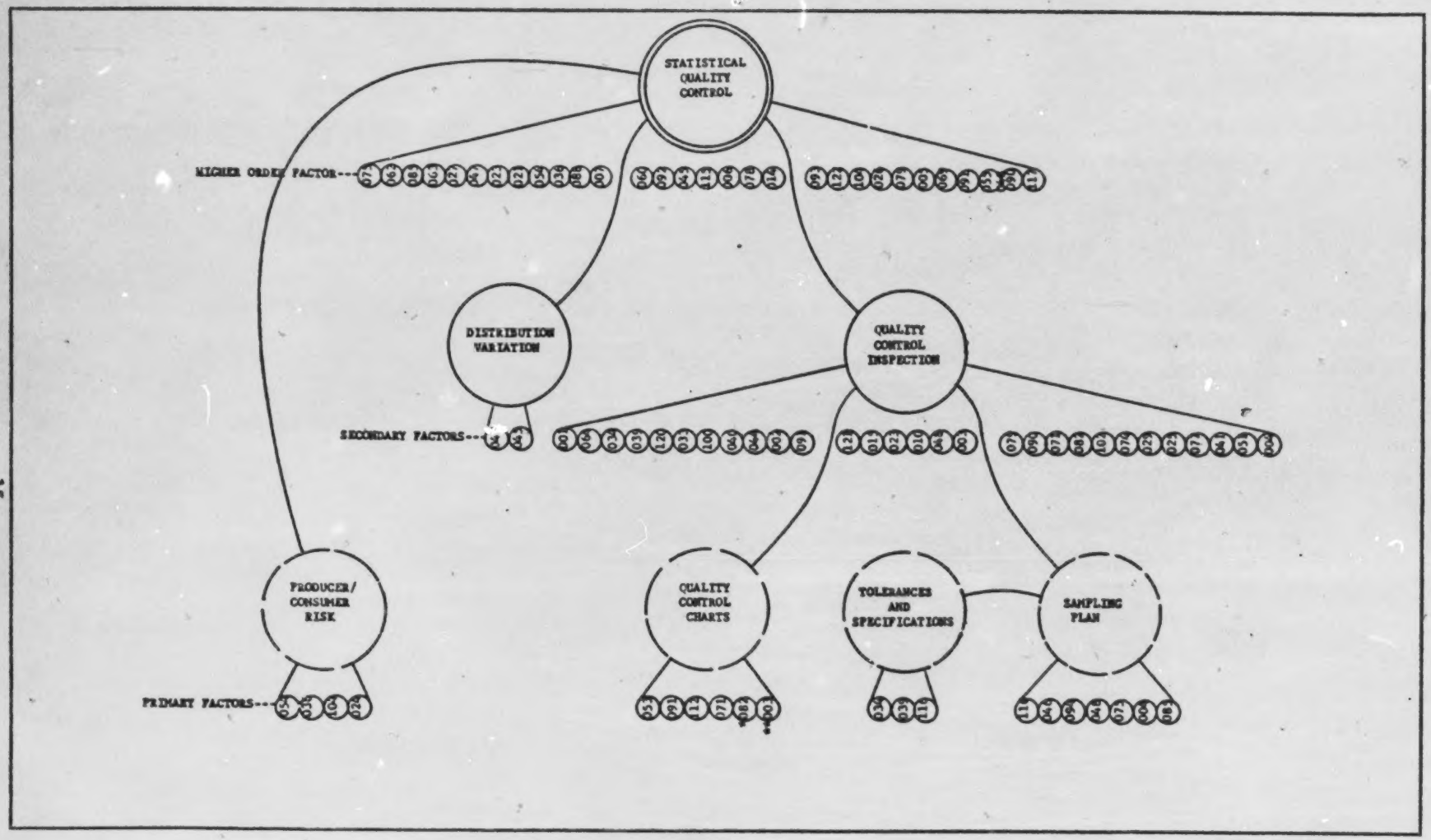


FIGURE 2

THE CONCEPTUAL STRUCTURE OF KEY (STIMULUS) WORD
CONCEPTS FOR A GROUP OF STATISTICAL QUALITY CONTROL SPECIALISTS

HIGHER LOADINGS

Statistical Quality Control

075	Statistical	.5360
062	Normal	.5089
085	Sample	.5023
063	Average	.4834
027	Population	.4808
047	Sigma	.4771
023	AQL	.4718
021	Probability	.4334
054	Beta	.4332
036	Alpha	.4317
088	Poisson	.4176
007	Chi-square	.4137
060	Binomial	.4020
092	Deviation	.3998
045	Distribution	.3985
115	Estimation	.3974
006	Frequency	.3798
078	OC-Curve	.3758
014	Significance	.3637
093	Hypothesis	.3601
122	F-Distribution	.3521
104	Risk	.3505
026	Variance	.3320
079	Lot	.3326
005	Non-Parametric	.3287
069	Bias	.3237
091	p-Chart	.3158
055	Median	.3154
048	Attribute	.3097
090	AOQL	.3049
117	Freedom	.3032

SECONDARY LOADINGS

Distribution/Variation

047	Sigma	.3798
045	Distribution	.3181

Control Inspection

001	Control	.5343
064	Limit	.5306
034	Tolerance	.5293
039	Specification	.5005
120	Go/No Go	.4607
033	Dimension	.4533
100	Cost	.4512
040	Inspection	.4480
044	Size	.4322
002	LCL	.4238
091	p-Chart	.4092
121	Quality	.4003
015	UCL	.3988
023	AQL	.3985
010	Material	.3803
048	Attribute	.3773
003	R-Chart	.3712
079	Lot	.3662
090	AOQL	.3630
071	c-Chart	.3558
082	μ-Chart	.3518
102	Range	.3457
074	MIL-STD	.3361
029	Alarm	.3330
025	Lot-by-Lot	.3199
077	Batch	.3171
041	AOQ	.3169
051	Defective	.3102
004	Variable	.3027

PRIMARY LOADINGS

Producer/Consumer Risk

054	Beta	.4551
036	Alpha	.4506
104	Risk	.3114
024	Theory	.3047

Quality Control Charts

053	Chart	.3904
091	p-Chart	.3723
112	np-Chart	.3712
071	c-Chart	.3356
*082	μ-Chart	(.2589)
**003	R-Chart	

Tolerances and Specifications

034	Tolerance	.3662
039	Specification	.3308
116	Correlation	.3142

Sampling Plan

116	Correlation	.4540
046	Regression	.4089
094	Continuous	.3367
048	Attribute	.3244
075	Statistical	.3207
004	Variable	.3057
085	Sample	.3033

*Included to complete concept area even though factor loading was below .3000.

**Included to complete concept area even though word did not load on factor.

Conclusions and Recommendations

The procedural model, data gathering instrument format, and computer programs developed and utilized during the project should be appropriate for use in developing associative conceptual structures (maps) for other technical and engineering related subject areas (e.g., management principles, computer science, industrial and engineering technologies, and related mathematics and sciences). The logical extension of this project would consist of the generation and publication of other associative structures.

The associative structure developed during this project does not provide the detailed technical content for inclusion in a curriculum, but it does indicate appropriate content selection and organization. The graphical maps depict the conceptual structure of the advisory committee selected by the project developer. Additional studies should include a larger group of quality control specialists and should take into consideration the total list of pooled quality control response words found in APPENDIX E which should be used as an expanded stimulus word list.

Other areas of potential study and development could include the:

1. development of instructional packages congruent with the conceptual structures (e.g., programmed instruction, UNIPACS, modules, etc.);
2. development of related psychomotor and/or affective structures for various quality control related occupations;
3. development of associative structures for other industries utilizing quality control activities (e.g., chemical, wood, electrical production); and
4. determination of the relationship of an individual's conceptual structure to personal characteristics (e.g., learning style, work experience, education, creativity, intelligence).

SELECTED REFERENCES

Ausubel, D.P. The Psychology of Meaningful Verbal Learning. New York, N.Y.: Grune and Stratton, Inc., 1963.

Bruner, J.S. The Process of Education. Cambridge, Mass.: Harvard University Press, 1960.

Deese, J. "On the Structure of Associative Meaning," Psychological Review 69: 161-75, 1962.

Deese, J. "The Associative Structure of Some Common English Adjectives," Journal of Verbal Learning and Verbal Behavior 3: 437-57, 1964.

Deese, J. The Structure of Associations in Language and Thought, Baltimore: The John Hopkins Press, 1965.

Garskof, B.D. and Houston, J.P. "Measurement of Verbal Relatedness: An Ideographic Approach," Psychological Review 70: 377-88, 1963.

Harmon, H.H. Modern Factor Analysis. Chicago, Ill.: The University of Chicago Press, 1967.

Johnson, P.E. "Associative Meaning of Concepts in Physics," Journal of Educational Psychology 55: 84-88, 1964.

Johnson, P.E. "Some Psychological Aspects of Subject Matter Structures," Journal of Educational Psychology 58: 75-83, 1967.

Johnson, P.E. "Word Relatedness and Problem Solving in High School Physics," Journal of Educational Psychology, 56: 217-224, 1965.

Mandler, G. "From Association to Structure," Psychological Review 69: 415-27, 1962.

Mason, E.E. "The Associative Meaning and Content Validity of Selected Elements from the Industrial Arts Curriculum Project's Taxonomy as Determined by Continued Word Association." Unpublished Doctoral Thesis. Columbus, Ohio: The Ohio State University, 1969.

Mednick, S.A. "The Associative Basis of the Creative Process," Psychological Review, 69: 220-232, 1962.

Moss, J. and Pucel, D.J. "Using the Free Association Methodology to Determine the Conceptual Structure of Radio and Television Repairmen." Minneapolis, Minn.: Minnesota Research Coordinating Unit for Vocational Education, 1967. (Ditto)

Nobel, Clyde E. "An Analysis of Meaning," Psychological Review, 59: 421-430, 1962.

SELECTED REFERENCES (Continued)

Pratzner, F.C. "Testing an Empirical Procedure for Identifying Technical Associative Conceptual Structure: Discriminating Between Workmen Within and Between Two Occupations." Unpublished Doctoral Thesis. Minneapolis, Minn.: University of Minnesota, 1969.

Smith, B.S. and Moss, J. (Ed). Report of a Seminar: Process and Techniques of Vocational Curriculum Development. Minneapolis, Minn.: Minnesota Research Coordinating Unit for Vocational Education, 1970.

Smith, B.S. "Testing an Empirical Procedure for Identifying Technical Associative Conceptual Structure: Discriminating Between Flexible and Inflexible Radio and Television Repairmen." Unpublished Doctoral Thesis. Minneapolis, Minn.: University of Minnesota, 1968.

APPENDIX A

QUALITY CONTROL SPECIALISTS

Hubert E. Helmle
1721 South State Street
Springfield, Illinois 62700
(Fiat-Allis Incorporated)

Bob McCreary
969 West Wood Street
Decatur, Illinois 62526
(Decatur Pump Company)

Ronald O. Gall
707 Monroe Street
Pawnee, Illinois 62558
(Hobbs Division Stewart-Warner Corporation)

Harlan Kumber
1043 South Drive
Mt. Pleasant, Michigan 48858
(Ferro Manufacturing Corporation)

Robert Carlson
24156 Farmington Road
Farmington, Michigan 48024
(Ferro Manufacturing Corporation)

John A. Thoman
RR 2
Rochester, Illinois 62563
(Fiat-Allis Incorporated)

Selwyn P. Shaw
8 South Court Drive
Decatur, Illinois 62526
(Caterpillar Tractor Company)

Gary L. Easterly
1289 Tobias
Clio, Michigan 48420
(General Motors Corporation)

David W. Collins
519 West Witherbee
Flint, Michigan 48503
(General Motors Corporation)

Donald Korty
1323 Kapp Court
Flushing, Michigan 48433
(General Motors Corporation)

Clifford W. Urmanic
410 Amesbury Drive
Davison, Michigan 48423
(General Motors Corporation)

Gary D. Meyer
12059 Riverbend Drive
Grand Blanc, Michigan 48439
(General Motors Corporation)

William R. Steffler
5030 Cedardale
Flushing, Michigan 48433
(General Motors Corporation)

APPENDIX B

QUALITY CONTROL SPECIALISTS' BACKGROUNDS

Quality Control Specialist	No. of Years in Q.C.	Educational Level	Job Classification
S01	13	College	Quality Engineer
S02	10	BSME	Director of Quality Control
S03	28	College	Quality Control Manager
S04	15	College	Quality Control Manager
S05	25	BS Business Administration	Director of Quality Assurance
S06	35	College	General Supervisor of Quality Assurance
S07	28	College	Inspection Manager
S08	5	BSIE	General Supervisor
S09	11	BAI Eng.	Quality Control Engineer
S10	9	MBA	Senior Quality Engineer
S11	11	MBA	Supervisor of Quality Engineering
S12	7	BME	General Supervisor of Quality Control
S13	27	BIE	Superintendent Quality Control

RESPONSE BOOKLET

THE IDENTIFICATION OF A CONCEPTUAL STRUCTURE OF STIMULUS CONCEPTS FOR QUALITY CONTROL SPECIALISTS

by
John G. Nee, Ed.D.
Project Developer
and
Robert M. McCreary, P.E.
Quality Control Specialist

Central Michigan University
Mount Pleasant, Michigan 48859
517/774-3996

GENERAL INFORMATION

Please supply the information requested in the spaces below. All responses will be kept confidential. The results will be used only for occupational education curriculum planning purposes, and you and your organization will not be identified in any published reports except as consultants. Your individual responses will not be reported. A copy of the report will be provided if desired. Please check here ( ) if you want to receive a report.

1. Your name: _____
2. Home address: _____
3. Social Security Number: _____
4. Number of years involved in quality control work: _____
5. Educational level: _____
6. Present job classification: _____
7. Name of company or organization: _____
8. Number of company employees at your location: _____
9. Telephone Number (work): _____
10. Product(s) produced or processed at your company location: _____

DIRECTIONS

On each of the following pages you will be given a single KEY WORD relating to the area of quality control. You are to write down as many other SINGLE words as you can which the KEY WORD brings to mind. These other words which you write down may be things, rules, ideas, activities, or whatever you happen to think of when you see the KEY WORD. The response is to be limited to quality control related words and should be given as a single word and NOT as phrases or short sentences. For a general example, not related to quality control, think of the word, KING. Some of the words which KING might bring to mind are written below:

25 Key Word: KING

1. Queen
2. Cole
3. Ruler

etc.

No one is expected to fill in all the spaces on a page, but write as many words as you can which the key word brings to mind. Be sure to think back to the key word after each word you write down because the test is to see how many other words the key word makes you think of. A good way to do this is to repeat the key word over and over as you write.

Key Word: Control Code: 001

RESPONSES
(only ONE WORD per blank space)

Control	1.	
Control	2.	
Control	3.	
Control	4.	
Control	5.	
Control	6.	
Control	7.	
Control	8.	
Control	9.	
Control	10.	
Control	11.	
Control	12.	
Control	13.	
Control	14.	
Control	15.	
Control	16.	
Control	17.	
Control	18.	
Control	19.	
Control	20.	

Key Word: LCL Code: 002

RESPONSES
(only ONE WORD per blank space)

LCL	1.	
LCL	2.	
LCL	3.	
LCL	4.	
LCL	5.	
LCL	6.	
LCL	7.	
LCL	8.	
LCL	9.	
LCL	10.	
LCL	11.	
LCL	12.	
LCL	13.	
LCL	14.	
LCL	15.	
LCL	16.	
LCL	17.	
LCL	18.	
LCL	19.	
LCL	20.	

APPENDIX D-1

DATA TABULATION SHEET

STIMULUS WORD: LCL CODE NO. 002

RESPONSE WORDS	WORKER/RESPONSE RANK 1	2	3	4	5	6	7	8	9	10	11	12	13	WORD FREQ.	$\bar{X}$ RANK	POOLED WORD LIST	FREQ.	** RANK	CODE NO.
LCL	1	1	1	1	1	1	1	1	1	1	1	1	1	13	1.00	LCL	13	39	403
UCL		2	1					1						3	1.30	*Chart	10	38	266
*Chart		3	2		4	4	5		5	4	3	6	2	10	3.80	Limits	8	37	419
Plot		4								10	10			3	8.00	Control	8	36	286
Measure		5					9							2	7.00	Lower	5	35	428
*Mean			3					2	4	5			4	5	3.60	*Mean	5	34	441
R			4									8		2	6.00	Sigma	4	33	571
Control					2	9	1	17	1	2	2	2		8	4.50	UCL	3	32	631
Variables					5		8							2	6.50	Process	3	31	517
Sigma					6	6		3					3	4	4.50	Plot	3	30	498
Characteristics						5					8			2	6.50	R-Chart	2	29	528
Process						7	3				4			3	4.70	Variable	2	28	645
Lower							2		2	1	1	1		5	1.40	Characteristic	2	27	264
Line									6	9				2	7.50	Measure	2	26	442
Limits		1			1	1	4		3	3		3	1	8	2.10	Line	2	25	421
RESPONSE TOTALS	3	6	4	0	6	9	9	20	8	11	11	8	4	99		GRAND TOTALS			
USABLE RESPONSE TOTALS	0	5	4	0	5	6	7	4	6	7	6	5	4	59		USABLE GRAND TOTAL			

*Indicates shared common responses of the key words "median" and "LCL".

**The rank order resulted from taking the longest pooled list of responses (38) given to a single stimulus word by the respondents. Following this ranking process each stimulus word was added to the top of these ranked sets of pooled response words with a frequency equal to the number of respondents and a rank value equal to that of the first emitted response plus one (Mason, 1969).

APPENDIX D-2

DATA TABULATION SHEET

STIMULUS WORD: Median CODE NO. 055

RESPONSE WORDS	WORKER/RESPONSE RANK 1	2	3	4	5	6	7	8	9	10	11	12	13	WORD FREQ.	$\bar{X}$ RANK	POOLED WORD LIST	FREQ.	** RANK	CODE NO.
Median	1	1	1	1	1	1	1	1	1	1	1	1	1	13	1.00	Median	13	39	443
*Mean	2	1					4	1						4	2.00	Middle	10	38	446
Middle		4	1	2	4		1		1	1	1	1	2	10	1.80	Center	6	37	260
*Chart		5	3											2	4.00	*Mean	4	36	441
Calculate		6							7					2	6.50	Value	4	35	644
Center			2		1		2		3			2	1	6	1.83	Rank	3	34	532
Statistical				1				4						2	2.50	Distribution	3	33	318
Value					2	2	5			4				4	3.30	Statistical	2	32	590
Rank					5	1				5				3	3.70	Group	2	31	373
Group						3					4			2	3.50	Frequency	2	30	363
Frequency						5					2			2	3.50	*Chart	2	29	266
Distribution							3				6		4	3	4.30	Calculate	2	28	254
RESPONSE TOTALS	2	6	3	2	6	5	5	7	7	5	8	5	3	64	GRAND TOTALS				
USABLE RESPONSE TOTALS	1	4	3	2	4	4	5	2	3	3	4	2	3	40	USABLE GRAND TOTAL				

*Indicates shared common responses of the key words "Median" and "LCL".

**The rank order resulted from taking the longest pooled list of responses (38) given to a single stimulus word by the respondents. Following this ranking process each stimulus word was added to the top of these ranked sets of pooled response words with a frequency equal to the number of respondents and a rank value equal to that of the first emitted response plus one (Mason, 1969).

APPENDIX E

POOLED WORD LIST

Code	Word	Code	Word	Code	Word
200	ABNORMAL	245	BLUEPRINT	290	COUNT
201	ACCEPT	246	BOARD	291	*CRITERIA(057)
202	*ACCURACY(068)	247	*BOUNDRY(101)	292	CRITICAL
203	ACHIEVEMENT	248	BREAKDOWN	293	*CUMULATIVE(113)
204	ACTUAL	249	BUILD	294	*CURVE(080)
205	ADDITIVE	250	BUREAU	295	CUSTOMER
206	ADJUST				
207	AFFECT	251	c	296	*d-TABLE(086)
208	AIR	252	*c-CHART(071)	297	*DATA(059)
209	*ALARM(029)	253	*CALIBRATION(099)	298	DAY
210	ALERT	254	CALCULATE	299	DECISION
211	*ALLOWANCE(008)	255	CAPABILITY	300	*DEFECTIVE(051)
212	ALONE	256	CARD	301	DEFINITION
213	*ALPHA(036)	257	CASE	302	*DEGREE(119)
214	ALPHABETICAL	258	CATEGORY	303	DEPARTMENT
215	ALTERNATIVE	259	*CAUSE(067)	304	DEPENDABLE
216	AMOUNT	260	CENTER	305	DEPENDENT
217	*ANALYSIS(096)	261	CERTIFY	306	DEPTH
218	ANGLE	262	CHANCE	307	DESCRIBE
219	*AOQ(041)	263	CHANGE	308	DESIGN
220	*AOQL(090)	264	*CHARACTERISTIC(013)	309	*DEVIATION(092)
221	APPORTIONMENT	265	CHARGE	310	DIFFERENCE
222	APPROACH	266	*CHART(053)	311	*DIMENSION(033)
223	APPROXIMATE	267	CHECK	312	DIRECT
224	*AQL(023)	268	*CHI-SQUARE(007)	313	*DISCRETE(009)
225	*ARITHMETIC(105)	269	*CLASS(017)	314	DISPERSION
226	ARRANGEMENT	270	*CODE(038)	315	DISSIMILAR
227	*ASSIGNABLE(109)	271	COEFFICIENT	316	DISTINCT
228	ASSUMPTION	272	COLLECTION	317	DISTORT
229	ASSURANCE	273	COMMON	318	*DISTRIBUTION(045)
230	ASSYMETRICAL	274	COMPARISON	319	DIVIDE
231	*ATTRIBUTES(048)	275	COMPONENT	320	DOCUMENT
232	AUDIT	276	COMPOSITION	321	DODGE-ROMIG
233	*AVERAGE(063)	277	CONCEPT	322	DOUBLE
		278	CONCERN	323	DRAWING
234	B	279	CONDITIONAL	324	DURABILITY
235	BAND	280	*CONFIDENCE(073)	325	DYNAMOMETER
236	BAR	281	CONFORMANCE		
237	*BATCH(077)	282	CONSUMER	326	EARLY
238	BELL	283	CONTENT	327	EFFECT
239	*BETA(054)	284	*CONTINUOUS(094)	328	ELECTRONIC
240	*BIAS(069)	285	CONTRACT	329	*EMPIRICAL(106)
241	BILATERAL	286	*CONTROL(001)	330	ENGINEER
242	BIMODAL	287	CORRECT	331	EQUATION
243	*BINOMIAL(060)	288	*CORRELATION(116)	332	EQUIPMENT
244	BLOCK	289	*COST(110)	333	*ERROR(019)

*Key(stimulus) word with original code number in parentheses ( ).

APPENDIX E (Continued)

POOLED WORD LIST

Code	Word	Code	Word	Code	Word
334	*ESTIMATION(115)	378	*HETEROGENEOUS(083)	422	*LINEAR(012)
335	ETHICS	379	HIGH	423	LIST
336	EVALUATION	380	*HISTOGRAM(087)	424	LOGARITHM
337	EVEN	381	*HOMOGENEOUS(097)	425	LOOSE
338	EVENT	382	HUMAN	426	*LOT(079)
339	EXACT	383	*HYPERGEOMETRIC(103)	427	*LOT-BY-LOT(025)
340	EXPANSION	384	*HYPOTHESIS(093)	428	LOWER
341	EXPENSE				
342	EXPERIMENT	385	*IQL(028)	429	MTBF
343	EXPONENT	386	IDEA	430	MACHINE
344	EXTEND	387	IDENTIFY	431	MAINTENANCE
345	EXTENT	388	IMPORTANT	432	MAJOR
		389	INCOMING	433	MANAGEMENT
346	F	390	INDEPENDENT	434	MANUAL
347	*F-DISTRIBUTION(122)	391	*INDEX(043)	435	MANUFACTURE
348	F-TEST	392	INDICATION	436	MANY
349	FACTORIAL	393	INDIVIDUAL	437	MASTER
350	FAILURE	394	INFERENCE	438	*MATERIAL(010)
351	FAULT	395	INFINITE	439	MATHEMATICS
352	FEATURE	396	INFLUENCE	440	MAXIMUM
353	FEW	397	INFORMATION	441	*MEAN(022)
354	FINAL	398	*INSPECTION(040)	442	MEASURE
355	FIRST	399	INSTRUMENT	443	*MEDIAN(055)
356	FIXTURE	400	*INTERVAL(076)	444	METHOD
357	FOLLOWING	401	*ISOLATION(072)	445	MICROMETER
358	FORM			446	MIDDLE
359	FORMULA	402	KNOWN	447	*MIL-STD(074)
360	FOURTH			448	MILITARY
361	*FRACTION(084)	403	*LCL(002)	449	MINIMUM
362	*FREEDOM(117)	404	*LQ(035)	450	MINOR
363	*FREQUENCY(006)	405	*LTPD(032)	451	MINUS
364	*FUNCTION(089)	406	LABEL	452	MISTAKE
		407	LABORATORY	453	MIXED
365	*GAGE(100)	408	LAMBDA	454	*MODE(016)
366	GAUSSIAN	409	LASTING	455	2nd-MOMENT
367	*GEOMETRIC(111)	410	LAYER	456	MONITOR
368	*GO/NO GO(120)	411	LAYOUT	457	*MORTALITY(056)
369	GOOD	412	LEFT	458	MOST
370	GOVERNMENT	413	LENGTH	459	*μ-CHART(082)
371	GRADE	414	LETTER	460	*MULTIPLE(050)
372	GRAPH	415	*LEVEL(058)	461	MULTIPLY
373	GROUP	416	LIFE		
374	GUESS	417	LIGHT	462	*np-CHART(112)
		418	LIKE	463	*NATURAL(107)
375	HANDLE	419	*LIMITS(064)	464	NEGATIVE
376	HAPPEN	420	LIMITLESS	465	NON-CONFORM
377	HARDNESS	421	LINE	466	NON-CONTINUOUS

APPENDIX E (Continued)

POOLED WORD LIST

Code	Word
467	NON-DESTRUCTIVE
468	NON-NORMAL
469	*NON-PARAMETRIC(005)
470	*NORMAL(062)
471	NOTHING
472	*NULL(066)
473	*NUMBER(095)
474	OBSERVATION
475	*OC-CURVE(078)
476	OCCURENCE
477	ODDS
478	ONE
479	ONE-TAIL
480	OPERATION
481	OPINION
482	ORDER
483	ORGANIZATION
484	OUTGOING
485	OVER
486	*p-CHART(091)
487	PARAMETER
488	*PARAMETRIC(037)
489	*PARETO(114)
490	PART
491	PATROL
492	PEAKS
493	PEOPLE
494	*PERCENT(031)
495	*PERFORMANCE(052)
496	PLAN
497	PLATE
498	PLOT
499	PLUG
500	PLUS
501	*POISSON(088)
502	POLYGON
503	*POPULATION(027)
504	PORTION
505	POSITIVE
506	PRECISION
507	PREDICTION
508	PREJUDICE
509	PRESSURE
510	PREVENT
511	PRIMARY
512	PRINCIPLE
513	PRINT
514	*PROBABILITY(021)
515	PROBLEM
516	PROCEDURE
517	PROCESS
518	PRODUCER
519	PRODUCT
520	PRODUCTION
521	PROGRAMMING
522	PROGRESSION
523	PROPERTY
524	PROVE
525	*QUALITY(121)
526	QUANTITATIVE
527	*QUARTILE(108)
528	*R-CHART(003)
529	RADIAN
530	*RANDOM(118)
531	*RANGE(102)
532	RANK
533	RATE
534	RATIO
535	RAW
536	REASON
537	RECEIVING
538	RECORD
539	REFERENCE
540	*REGRESSION(046)
541	*REJECT(098)
542	RELATE
543	*RELIABILITY(011)
544	REPAIR
545	REPEATABILITY
546	REPLACEMENT
547	REPORT
548	REQUIREMENT
549	RESTRICT
550	RESULT
551	RETURN
552	REVIEW
553	RIGHT
554	RING
555	*RISK(104)
556	ROTATE
557	RULE
558	RUN
559	SAME
560	*SAMPLE(085)
561	SCOPE
562	SCRAP
563	SEAL
564	SECOND
565	SELECT
566	SEPARATE
567	*SEQUENTIAL(065)
568	SETTING
569	SHAPE
570	SHIFT
571	*SIGMA(047)
572	SIGN
573	*SIGNAL(070)
574	*SIGNIFICANCE(014)
575	SIMILAR
576	SINGLE
577	SIX
578	*SIZE(044)
579	*SKEW(ED)(081)
580	SLANT
581	SPACE
582	SPAN
583	SPECIFIC
584	*SPECIFICATION(039)
585	SPREAD
586	SQUARE
587	*STANDARD(018)
588	STANDARD-DEVIATION
589	STATION
590	*STATISTICAL(075)
591	STOP
592	STORAGE
593	STRAIGHT-LINE
594	STRENGTH
595	STUDENT
596	STUDY
597	SUBTRACT
598	SUCCESS
599	SUM
600	SUMMARY
601	SUPERVISOR
602	SUPPOSE

APPENDIX E (Continued)

POOLED WORD LIST

Code	Word
603	SURFACE
604	SYMBOL
605	SYMMETRY
606	SYSTEM
607	t
608	*t-TEST(042)
609	*TABLE(030)
610	TABULATION
611	TAIL
612	TALLY
613	TECHNIQUE
614	TENDENCY
615	*TEST(061)
616	*THEORY(024)
617	THREAD
618	THREE
619	TIGHT
620	TILT
621	TIME
622	*TOLERANCE(034)
623	TOTAL
624	TRAINING
625	TREATMENT
626	TREND
627	TRIAL
628	TRY
629	TWO-TAIL
630	*TYPE(049)
631	*UCL(015)
632	UNACCEPTABLE
633	UNBALANCED
634	UNBIASED
635	UNDER
636	UNIFORM
637	UNILATERIAL
638	UNIQUE
639	UNIT
640	*UNIVERSE(020)
641	UNLIKE
642	UNRELATED
643	UPPER
644	VALUE
645	*VARIABLE(004)
646	*VARIANCE(026)
647	VENDOR
648	VERIFY
649	VISUAL
650	VOID
651	VOLUME
652	WARN
653	WARRANTY
654	WEAR
655	WEAROUT
656	WEIBULL
657	WHOLE
658	WIDTH
659	WORK
660	$\bar{X}$
661	X-CHART
662	ZERO
663	105

```
$RUN PJNEE,21456,389348000,5,1000
$FOR,ISC SORTR
FOR 0063-03/16/77-11:46:55 (,0)

   SUBROUTINE SORTR     ENTRY POINT 000112

   STORAGE USED: CODE(1) 000126; DATA(0) 000026; BLANK COMMON(2) 000000

   EXTERNAL REFERENCES (BLOCK, NAME)
    0003   NERR3S

   STORAGE ASSIGNMENT  (BLOCK, TYPE, RELATIVE LOCATION, NAME)
    0001   000007 10L        0001   000030 1206       0001   000016 20L       0001   000033 40L       0001   000071 60L
    0001   000074 70L        0000 I 000003 I          0000   000007 INJPS     0000 I 000000 ITEMP     0000 I 000002 J
    0000 I 000001 K          0000 I 000004 L          0000 I 000000 M          0000 R 000005 TEMP

C0100      1*      C     S H E L L  S O R T                                                  SORT 007   000005
C0100      2*      C     REFERENCES..                                                        SORT 008   000005
C0100      3*      C        D.L. SHELL, CACM, VOL 2(1959), PP30..32                          SORT 009   000005
C0100      4*      C        T.N. HIBBARD, SDC REPORT SP-982                                  SORT 010   000005
C0100      5*      C        J. BOOTHROYD, CACM, ALGORITHM 201                                SORT 011   000005
C0100      6*      C     THIS IS A FORTRAN VERSION OF ALGORITHM 201                          SORT 012   000005
C0101      7*                                                                               SORT 013   000005
C0101      8*            SUBROUTINE  SORTR( A, N, B)                                        SORT 014   000005
C0103      9*               INTEGER A(64)                                                             000005
C0104     10*             DIMENSION A(64)                                                            000005
C0104     11*      C        FIND M= ONE LESS THAN LEAST POWER OF 2.GT.N                      SORT 017   000005
C0105     12*            M=0                                                                SORT 019   000005
C0106     13*      10    M=M+M+1                                                            SORT 020   000007
C0107     14*            IF(M-N)10,20,20                                                    SORT 021   000012
C0111     15*      C        20 OUTER LOOP . . HALVE M.                                      SORT 023   000012
C0112     16*      20    M=M/2                                                              SORT 025   000016
C0113     17*      C        TEST FOR END OF OUTER LOOP                                      SORT 027   000016
C0113     18*            IF(M)70,70,30                                                      SORT 029   000020
C0113     19*      C        FIND LIMIT FOR MIDDLE LOOP.                                     SORT 031   000020
C0114     20*      30    K=N-M                                                              SORT 033   000022
C0116     21*      C        BEGIN MIDDLE LOOP                                               SORT 035   000022
C0117     22*            DO 60 J=1,K                                                        SORT 037   000024
C0117     23*      C        SETUP FOR INNER LOOP                                            SORT 039   000024
C0122     24*            I=J                                                                SORT 041   000030
C0122     25*      C        MIDDLE AND INNER LOOP COMPARE                                   SORT 043   000030
C0123     26*      40    L=I+M                                                              SORT 045   000033
C0124     27*            IF ( A(I)   - A(L)  ) 50, 50, 60                                           000045
C0124     28*      C              NOT IN SEQUENCE   SO SWAP                                 SORT 048   000045
C0127     29*         50 TEMP = A(I)                                                                 000051
C0130     30*            A(I)=A(L)                                                          SORT 051   000053
C0131     31*            A(L)  = TEMP                                                               000055
C0132     32*            ITEMP=B(I)                                                         SORT 053   000056
C0133     33*            B(I)=B(L)                                                          SORT 054   000060
C0134     34*            B(L)=ITEMP                                                         SORT 055   000062
C0134     35*      C              GO DOWN INNER LOOP    ONLY IF SWAP                        SORT 057   000062
C0135     36*      C        I=I-M                                                           SORT 059   000063
C0135     37*      C        TEST FOR END OF INNER LOOP                                      SORT 061   000063
C0136     38*            IF(I) 60,60,40                                                     SORT 063   000066
C0139     39*      C        END OF MIDDLE AND INNER LOOP                                    SORT 065   000066
C0141     40*      60    CONTINUE                                                           SORT 067   000072
C0143     41*            GOTO20                                                             SORT 068   000072
C0143     42*      C        SORT COMPLETE                                                   SORT 070   000072
C0144     43*      70    RETURN                                                             SORT 072   000074
C0145     44*            END                                                                SORT 073   000125

      END OF COMPILATION:        NO  DIAGNOSTICS.

$FOR,ISC  BANKA
FOR 0063-03/16/77-11:47:03 (,0)
```

```
SUBROUTINE RANKA     ENTRY POINT 000241

STORAGE USED: CODE(1) 000257; DATA(0) 001023; BLANK COMMON(2) 000000

EXTERNAL REFERENCES (BLOCK, NAME)
 0003   NERR33

STORAGE ASSIGNMENT  (BLOCK, TYPE, RELATIVE LOCATION, NAME)
 0001   000020 1676      0001   000031 1156      0001   000065 1406      0001   000027 15L       0001   000144 1606
 0001   000167 1766      0001   000051 20L       0001   000215 2136      0001   000207 30L       0001   001113 32L
 0001   002134 34L       0001   000205 51L       0001   000200 52L       0000 I 000765 I         0000 I 000766 INEW
 0200   001000 INJPS     0000 I 000455 IS        0000 R 000310 ITEMP     0000 I 000771 J         0000 I 000773 JJ
 0000 I 000767 K         0000 I 000775 L         0000 R 000000 NMAT      0000 I 000770 NN        0000 R 000774 RN
 0000 R 000311 S         0000 R 000772 SUM
```

```
00100      1*      C SUBROUTINE TO RANK A VECTOR                                                    000020
00100      2*      C   MAT IS THE INPUT VECTOR OF LENGTH N                                          000020
00102      3*      C   R IS THE OUTPUT VECTOR  CORRESPONDING TO MAT OF LENGTH N                     000020
00100      4*      C   R IS THE ORDERED VECTOR OF LENGTH N                                         000020
00101      5*              SUBROUTINE RANKA(MAT,R,RR,N)                                             000060
00103      6*              REAL MAT(200),NMAT(200),ITEMP                                            000020
00104      7*              DIMENSION R(200), S(100)                                                 000020
00135      8*              DIMENSION IS(200),RR(200)                                                000020
00106      9*              DO 10 I=1,N                                                              000060
00111      10*             IS(I) = I                                                                000020
00112      11*         10  NMAT(I) = MAT(I)                                                         000022
00114      12*             DO 20 I=2,N                                                              000031
00117      13*             IF(NMAT(I)-NMAT(I-1))21,20,20                                            000031
00122      14*         21  ITEMP = NMAT(I)                                                         000035
00123      15*             NMAT(I) = NMAT(I-1)                                                      000037
00124      16*             NMAT(I-1) = ITEMP                                                        000041
00125      17*             INEW = IS(I)                                                             000042
00126      18*             IS(I) = IS(I-1)                                                          000044
00127      19*             IS(I-1) = INEW                                                           000046
00130      20*             GO TO 15                                                                 000047
00131      21*         20  CONTINUE                                                                000052
00133      22*             K=1                                                                      000055
00134      23*             NN = N-1                                                                 000054
00135      24*             J = 1                                                                    000057
00136      25*             SUM = 0.0                                                                000060
00137      26*             DO 30 I=1,NN                                                             000065
00142      27*             IF(NMAT(I) - NMAT(I+1))32,31,15                                          000067
00145      28*         31  S(J) = K                                                                000074
00146      29*             J=J+1                                                                    000100
00147      30*             K = K+1                                                                  000103
00151      31*             IF(K-NN)30,30,34                                                         000106
00153      32*         32  IF(J-1) 33,33,34                                                        002113
00156      33*         33  R(K) = K                                                               000160
00157      34*             J = 1                                                                    000123
00160      35*             K = K+1                                                                  000125
00161      36*             IF(K-NN) 30,30,52                                                        000127
00164      37*         34  S(J) = K                                                               000134
00165      38*             DO 40 JJ = 1,J                                                           000137
00170      39*         40  SUM = SUM+S(JJ)                                                        000144
00172      40*             RN = SU=/J                                                               000147
00173      41*             SUM = 0.0                                                                000153
00174      42*             L = K-J+1                                                                000154
00175      43*             DO 50 JJ=L,K                                                             000160
00200      44*         50  R(JJ) = RN                                                              000167
00202      45*             K=K+1                                                                    000171
00203      46*             IF(K-NN)51,51,52                                                         000174
00206      47*         52  R(K) = K                                                               000200
00207      48*         51  J = 1                                                                   000205
00210      49*         30  CONTINUE                                                               000210
00212      50*             DO 60 I=1,N                                                              000212
00215      51*             J = IS(I)                                                                000215
```

```
00216     52•          60 PR(J) = R(I)                                                    000220
00237     53•             RETURN                                                          000243
00241     54•             END                                                             000256

      END OF COMPILATION:        NO  DIAGNOSTICS.

$FOR,ISC  RCCOEF
FOR (0063-03/16/77-11:47:09 (,0)
   MAIN PROGRAM

   STORAGE USED: CODE(1) 000501; DATA(0) 124011; BLANK COMMON(2) 000000

   EXTERNAL REFERENCES (BLOCK, NAME)

      0002   RANKA
      0004   SORTR
      0005   EXIT
      0006   MINTRS
      0007   MPSUS
      000A   MIOIS
      000B   MIO2S
      000C   MPSUT
      000D   MSTOPS

   STORAGE ASSIGNMENT  (BLOCK, TYPE, RELATIVE LOCATION, NAME)

      0000    123742 10F        0000    123755 110F       0001    000030 113G       0001    000055 126G       0001    000122 143G
      0000    123737 15F        0001    000143 160G       0001    000157 172G       0001    000175 177G       0000    123752 179F
      0000    123744 20F        0001    000207 206G       0001    000222 212G       0001    000252 221G       0001    000307 234G
      0000    123747 25F        0001    000327 250G       0001    000342 254G       0001    000357 262G       0001    000364 266G
      0000    123731 325F       0001    000424 307G       0001    000436 315G       0001    000445 324G       0000    123727 5F
      0001    000423 700L       0001    000406 800L       0000    123757 805F       0001    000454 807L       0000    123772 809F
      0000    123761 810F       0000 R  123506 A          0000 R  123604 B          0000 R  123714 CONST       0000 I  123704 DENOM
      0000 R  041270 FREQ       0000 R  123703 HMR        0000 R  123710 HR         0000 I  123706 I          0000 I  123724 IN
      0000 I  123721 INW        0000 I  123722 IW         0000 I  123712 J          0000 I  123716 JI         0000 I  123715 JN
      0000 I  123711 JNW        0000 I  123723 JW         0000 I  123726 L          0000 I  000000 LIST       0000 I  123705 MR
      0000 I  123702 NLIST      0000 I  123717 NUM        0000 I  062024 NW         0000 I  123713 NWK        0000 R  062216 R
      0000 R  020534 RANK       0000 R  123720 RC         0000 R  102752 RR         0000 R  123725 TOP        0000 R  123707 X


00100      1•      C PROGRAM TO CALCULATE RC COEFFICIENTS                                000000
00100      2•      C LIST CONTAINS THE WORD CODES                                        000000
00100      3•      C RANK CONTAINS THE MEAN RAW RANK OF WORDS ON LIST                    000000
00100      4•      C FREQ CONTAINS NUMBER OF WORDS MEAN RAW RANK IS BASED ON             000000
00100      5•      C NLIST = NUMBER OF LISTS TO BE PROCESSED                             000000
00100      6•      C JNW IS FOR EACH LIST THE NUMBER OF WORDS ON THAT LIST               000000
00100      7•      C HR CONTAINS THE OUTPUT RANKS FROM THE RANK A PROGRAM                000000
00100      8•      C HMR = LENGTH OF LONGEST LIST--DETERMINES DENOMINATOR OF RC          000000
00100      9•      C                                                                     000000
00101     10•            DIMENSION LIST(70,122), RANK(70,122), FREQ(70,122), NW(122),   000000
00101     11•           1R(70,122), RR(70,122), A(62), B(62)                            000000
00101     12•      C READ IN NUMBER OF LISTS TO BE PROCESSED--NLIST                      000000
00107     13•            READ ( 5, 5) NLIST    ,HMR                                     000001
00107     14•          5 FORMAT ( I5, F3.0)                                            000013
00110     15•            DENOM = 0.0                                                   000013
00111     16•            MR = HMR                                                      000014
00112     17•            DO 300 I = 1, MR                                              000025
00115     18•            X = I                                                         000030
00119     19•        300 DENOM = DENOM + X * X                                         000033
00120     20•            DENOM = DENOM - 1.0                                           000041
00124     21•            WRITE ( 6,305) DENOM                                          000043
00124     22•        305 FORMAT ( 1HO,    RC DENOMINATOR ="  F16.2)                    000055
00125     23•            DO 50 I = 1, NLIST                                            000055
00130     24•            WRITE ( 6,15) I                                               000065
00133     25•         15 FORMAT ( 1HO,"LIST" I5)                                       000073
00134     26•            READ ( 5, 10) LIST(1,I), NW(I) ,MR                            000075
00141     27•         10 FORMAT ( 2I3, F2.0)                                           000103
00142     28•            JNW = NW(I)                                                   000103
00143     29•            READ ( 5, 20) ( LIST(J,I), RANK(J,I), FREQ(J,I), J=2, JNW)    000105
00153     30•         20 FORMAT ( 7 ( I3, F5.2, F2.0)  )                               000127
```

```
                      RANK(1,I) = 1.0                                                   000127
                      FREQ(1,I) = 1.0                                                   000131
                      WRITE ( 6, 25) (LIST(J,I), RANK(J,I), FREQ(J,I), J=1,JNW)         000135
                25    FORMAT (          7 ( I5, F7.2,F4.0) )                          000157
                50    CONTINUE                                                        000157
                      DO 401 J = 1,122                                                000163
                      RANK(1,J) = RANK(1,J) + 15.0                                    000166
                      NUF = NW(J)                                                     000170
                      DO 402 I = 2, NUF                                               000175
                402   RANK(I,J) = 16 - RANK(I,J)                                      000207
                401   CONTINUE                                                        000207
            C INPUT IS IN-- NOW RANK THE RAW RANKS                                    000207
                      DO 200 I = 1, NLIST                                             000213
                      JNW = NW(I)                                                     000215
                      DO 100 J = 1, JNW                                               000222
                100   RANK ( J,I)  =  ( FREQ(J,I)  * RANK(J,I)  )                    000255
                      CALL RANKA ( RANK(1,I), R(1,I), RR(1,I), JNW)                   000255
            C CONVERT TO HIGH 62 FORM                                                 000243
                      CONST = HPP - RR(1,I)                                           000252
                      DO 150 J = 1, JNW                                               000252
                150   RR(J,I)  = RR(J,I)  + CONST                                     000255
            C SORT SO LARGEST RANKS ARE AT TOP                                        000255
                      CALL SORTR ( RR(1,I), JNW, LIST(1,I)  )                         000266
                      WRITE ( 6, 179) I                                               000277
                179   FORMAT ( 1H1 , ' LIST' I5//)                                    000277
                      WRITE ( 6, 110) ( RANK(J,I), R(J,I), RR(J,I),LIST(J,I), J = 1, JNW)  000277
                     1 )                                                              000320
                110   FORMAT ( 3F12.3, I10)                                           000320
                200   CONTINUE                                                        000320
            C MAKE UP VECTORS FOR RC FORMULA-- I AND J CYCLE THRU LISTS                000320
                      JN = NLIST - 1                                                  000323
                      DO 1000 I = 1, JN                                               000333
                      JI = I + 1                                                      000336
                      DO 900 J = JI , NLIST                                           000336
            C NUM COUNTS HOW MANY FACTORS IN NUMERATOR OF RC FORMULA                   000346
                      NUM = 0                                                         000347
                      RC = 0.0                                                        000357
            C IW AND JW CYCLE THRU WORDS ON LIST                                      000350
                      INW = NW(I)                                                     000352
                      DO 800 IW = 1, INW                                              000357
                      JNW = NW(J)                                                     000361
                      DO 700 JW = 1, JNW                                              000366
                      IF ( LIST ( IW,I)  - LIST ( JW , J)  ) 700, 510, 700            000371
                510   NUM = NUM + 1                                                   000375
                      A(NUM)  = RR(IW, I)                                             000377
                      B(NUM)  = RR(JW, J)                                             000401
                      GO TO 800                                                       000410
                700   CONTINUE                                                        000410
                800   CONTINUE                                                        000410
                      IF(NUM .EQ. 0) GO TO 807                                        000417
                      WRITE ( 6, 805)(A(IN), IN = 1, NUM)                             000423
                      WRITE ( 6, 805)(B(IN), IN = 1, NUM)                             000441
                805   FORMAT ( 20F6.2)                                                000441
            C NUMERATOR FACTORS SET UP-- CALCULATE RC                                 000441
                      TOP = 0.0                                                       000445
                      DO 820 L = 1, NUM                                               000445
                820   TOP = TOP + A(L)  * B(L)                                        000451
                      RC = TOP / DENOM                                                000454
                807   WRITE ( 6, 830) RC, I, J                                        000463
                830   FORMAT ( 5X, ' RC = ', F12.6, ' FOR LISTS' I5, ' AND' I5)       000463
                      WRITE(6,809)                                                    000474
                809   FORMAT(' ')                                                     000474
                900   CONTINUE                                                        000474
                1000  CONTINUE                                                        000474
                      CALL EXIT                                                       000500
                      END

      END OF COMPILATION:        NO  DIAGNOSTICS.

$MAP,IN
P3P28D1 RL71-3 03/16/77 11:47:15
END MAP

$XQT
```

PC DENOMINATOR = 20539.00

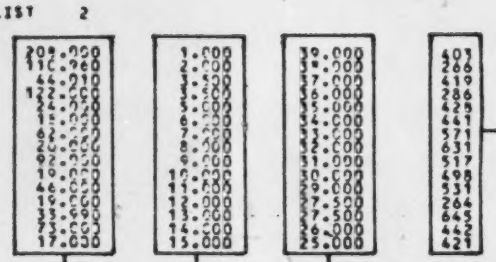
LIST	1																				
246	1.00	13:	525	1.92	13:	606	5.71	7:	266	7.92	12:	560	10.25	4:	517	5.29	7:	289	9.50	4:	
419	5.86	9:	560	3.50	2:	420	7.00	2:	520	7.33	3:	365	9.83	6:	264	7.00	2:	398	9.20	5:	
232	6.67	3:	611	9.50	2:	255	8.50	2:	442	11.50	2:	312	8.00	2:	438	9.00	3:	543	16.00	2:	
255	8.50	2:	573	9.50	2:	300	8.00	3:	415	13.50	2:	516	13.50	2:							
LIST	2																				
409	1.00	13:	419	2.13	8:	631	1.33	3:	266	3.80	10:	498	8.02	3:	442	7.00	3:	441	3.60	5:	
231	6.00	2:	286	4.50	8:	645	6.50	2:	571	4.50	4:	264	8.50	2:	517	4.67	3:	428	1.40	5:	
421	7.55	2:																			
LIST	3																				
253	1.00	13:	441	2.60	5:	318	4.50	2:	331	2.00	12:	286	6.88	8:	445	9.50	2:	442	4.00	3:	
428	6.50	2:	419	7.40	5:	643	4.25	4:	428	5.25	4:	297	5.00	2:	585	1.50	2:	255	3.00	2:	
646	4.29	7:	227	7.00	2:	517	7.00	3:	560	9.50	2:	430	3.00	3:							
LIST	4																				
645	1.00	13:	441	4.00	2:	263	2.00	3:	390	6.00	5:	305	6.60	5:	297	4.25	4:	360	3.00	4:	
442	3.73	4:	276	5.50	2:	266	6.00	2:	231	2.75	4:	517	5.00	2:	284	2.50	2:	531	5.00	2:	
264	1.75	4:	565	5.50	2:	530	1.50	2:	473	3.00	2:										
LIST	5																				
442	1.00	13:	318	3.20	5:	294	1.50	2:	590	1.75	4.	444	2.50	2.	530	1.50	2.	615	2.25	4.	
384	5.50	2:	560	8.00	2:	572	4.00	2:													
LIST	6																				
463	1.00	13:	318	1.20	10:	266	4.33	6:	531	5.33	3:	476	3.00	4:	380	3.71	7:	609	9.00	2:	
314	3.50	2:	610	4.67	3:	293	4.75	4:	502	7.50	2:	300	4.67	3:	216	4.00	2:	571	3.00	2:	
419	6.20	5:	574	11.00	2:	297	5.00	2:	473	2.00	2:	364	8.50	2:	441	7.50	2:	400	5.00	2:	
615	9.00	2:																			
LIST	7																				
268	1.00	13:	615	3.00	6:	318	1.22	9:	266	4.33	3:	514	3.33	3:	609	5.00	2:	474	4.50	2.	
616	5.00	2:	324	5.50	2:	348	1.50	2:	590	3.50	2:	560	6.50	2:	579	4.00	2:				
LIST	8																				
211	1.00	13:	622	2.67	12:	419	2.00	3:	308	2.50	2.	654	3.00	2.	333	3.33	3.	555	3.50	2.	
240	4.00	2:	584	2.00	5:	365	4.67	3:													
LIST	9																				
213	1.00	13:	566	2.00	4:	297	2.25	4:	560	2.50	2.	657	3.00	2.	393	1.50	2.	318	2.50	2.	
583	3.67	3:	466	2.00	2:	472	3.00	2.													
LIST	10																				
428	1.00	13:	276	1.50	2:	300	2.00	4:	594	3.00	2:	584	2.00	7:	284	3.00	10:	246	2.50	2:	
562	4.25	4:	577	7.00	5:	211	5.50	2:	217	4.50	5:	517	4.67	3:	508	3.00	3:	201	6.00	3:	
541	8.50	2:	375	6.50	2:	592	7.50	2:	430	4.50	2:										
LIST	11																				
543	1.00	13:	364	1.00	2:	217	7.00	4:	656	5.33	6:	408	5.00	2:	429	7.50	2:	280	7.00	2:	
615	5.22	9:	416	5.00	4:	221	10.50	2:	330	3.50	6:	606	3.50	4:	525	4.40	5:	364	4.50	4:	
550	5.25	4:	516	4.50	2:	560	7.00	3:	254	9.00	2:	308	6.80	5:	507	7.00	3:	621	6.00	5:	
297	8.50	2:	653	7.25	4:	275	6.67	3:	289	9.67	3:	295	8.00	2:	495	9.67	3:	324	9.67	3:	
409	4.50	2:	519	5.50	2:	364	5.50	2.													
LIST	12																				
622	1.00	13:	442	2.80	5:	337	2.50	2:	331	3.00	3:	540	5.40	5:	342	3.50	3:	321	2.50	3:	
285	2.00	4:	364	5.00	2:	593	2.60	5:	372	5.33	3:	645	5.50	2:	294	2.67	3:	498	5.67	3:	
LIST	13																				
264	1.00	13:	490	4.33	3:	311	2.80	5:	332	8.75	4:	377	7.50	2:	269	6.00	3:	442	6.00	5:	
645	5.00	4:	523	5.00	2:	525	2.33	3:	292	4.00	3:	432	3.50	5:	450	4.50	2:	578	4.50	2:	
644	4.00	2:	524	2.00	6:	316	6.67	3:	487	3.00	3:	441	6.33	3:	294	3.50	2:				
LIST	14																				
574	1.00	13:	473	3.50	2:	615	2.45	11:	590	4.33	6:	310	5.20	5:	280	3.00	2:	388	4.20	5.	
284	1.33	3:	318	4.50	2:	333	5.00	2:	560	7.50	2:	415	6.33	3:	299	6.50	2:				
LIST	15																				
631	1.00	13:	403	2.75	4:	528	3.00	2:	661	3.00	2:	441	4.17	6:	286	4.13	8:	419	3.13	8:	
246	4.10	10:	440	3.50	2:	571	6.00	3:	645	6.00	2:	646	4.00	2:	560	5.50	2:	517	4.67	3:	
626	8.00	2:	643	5.75	4:	442	9.00	3:	498	9.00	2:										
LIST	16																				

* Pooled word list code

Frequency of response

Average rank in terms of when the response was given (closeness to key stimulus word)

LIST	47																					
571	1:00	13:	309	3:00	8:	419	4:00	3:	234	4:30	4:	618	3:30	4:	587	3:00	5:	531	4:00	5:		
646	3:07		318	3:37		441	4:33	3:	514	2:00	2:	585	4:30	2:	559	4:00	5:	574	7:00	3:		
503	9:25	4:	560	9:33	3:	590	9:00	3:	586	4:00	2:			2:	577	1:00	2:	508	7:00	2:		
LIST	48																					
231	1:00	13:	264	3:25	8:	398	3:00	4:	442	2:00	2:	368	2:67	3:	360	3:30	4:	284	4:67	3:		
201	5:50	2:	297	2:50	5:	313	1:25	4:	613	7:00	3:	360	4:50	2:	217	7:00	2:	494	4:50	2:		
496	7:50	2:	252	8:50	2:	300	4:50	2:	525	5:33	3:											
LIST	49																					
630	1:00	13:	286	3:00	2:	213	1.00	6.	239	2.00	6.	201	6.00	2.	333	3.83	6.	384	4.00	2.		
555	3.20	2:	475	6.00	2:																	
LIST	50																					
460	1:00	13:	540	1:86	7:	436	3:40	5:	560	3:29	7:	567	4.00	2.	482	3.50	2.	373	4.50	2.		
225	2.50	2:	297	3.00	2:	645	5.00	2:	496	3.50	2:											
LIST	51																					
300	1:00	13:	490	2:50	8:	606	8:00	3:	539	1:75	4:	544	3:00	4:	562	3:40	5:	426	6:20	5:		
551	6:00	2:	494	3:00	7:	560	3:00	7:	555	3:50	3:	519	7:00	3:	266	6:00	4:	286	7:80	3:		
289	7:25	4:	465	6:50	2:	535	1:50	2:	639	4:50	2:	398	7:50	2:	514	6:00	2:	458	4:50	2:		
365	9:50	2:																				
LIST	52																					
495	1:00	13:	294	2:33	3:	517	3:20	5:	430	4:00	3:	584	3:00	3:	615	6:67	3:	297	4:50	4:		
291	8:50	2:	442	4:67	5:	201	3:30	5:	533	1:50	3:	490	4:00	5:	525	1:00	3:	557	3:67	3:		
543	2.50	2:	203	3.50	2:	264	6.00	2:	415	5.00	3:	333	6.50	2:	596	1.50	2:	318	6.50	2:		
LIST	53																					
266	1:00	13:	226	2:89	9:	441	2:22	9:	531	2:88	8:	372	2:00	3:	419	6:50	2:	236	4:33	3:		
498	4:33	6:	486	3:57	7:	251	4:58	4:	546	6:50	3:	340	8:00	2:	300	8:50	3:	519	4:00	2:		
646	6:50	3:	297	9:33	3:	590	6:33	3:	525	9:50	2:	584	10:00	5:	295	6:50	2:					
LIST	54																					
239	1:00	13:	234	1:50	2:	333	3:33	6:	213	1:75	4:	630	4:50	2:	282	3:00	2:	255	2:00	7:		
560	3:00	3:	514	5:00	5:	201	3:67	3:	590	8:00	3:	384	7:75	4:	644	6:00	2:	475	3:00	3:		
516	2.50	2:	414	2.00	2:	280	5.50	2:	615	7.33	3:											
* LIST	55																					
443	1:00	12:	441	2:00	4:	446	1:30	10:	266	4:00	3:	334	6:30	3:	260	1.83	6.	590	2.50	2.		
644	3.25	2:	532	3.67	3:	373	3.30	2:	563	3.50	2:	318	4.33	3:								
LIST	56																					
457	1:00	13:	416	2:25	4:	533	1:83	6:	615	4:33	3:	350	3:83	6:	543	2:20	4:	289	2:00	2:		
609	4.67	3:	655	4.00	3:	294	8.67	3:	308	9.00	2:	621	3.67	3:	656	5.00	3:	326	10.00	2:		
LIST	57																					
291	1:00	13:	587	2:00	4:	615	5:00	2:	201	2:67	3:	442	2.50	2.	301	3.00	2.	557	3.00	4.		
549	2.33	3:	584	2.00	2:	398	3.50	2:	487	2.00	2:											
LIST	58																					
415	1:00	13:	525	3:43	7:	201	2:25	4:	484	6:00	3:	389	7.00	2.	560	3.75	4.	574	2.80	5.		
622	4.00	3:	280	3.33	6:	337	6.50	2:	495	4.00	3:											
LIST	59																					
297	1:00	13:	517	3:07	3:	286	5:33	3:	442	2:25	4:	254	3:30	2:	266	7:00	3:	202	4:30	3:		
517	4:83	6:	572	3:71	7:	526	4:30	4:	315	8:50	3:	535	3:00	3:	591	7:00	3:	158	8:50	4:		
397	5.75	4:	372	6.00	2:	590	3.33	3:	441	4.33	3:	531	3.50	2:	518	5.50	4:	473	4.00	4.		
LIST	60																					
243	1:00	13:	318	2:36	11:	360	3:67	3:	616	1:33	3:	439	3:00	2:	294	5:33	3:	340	3:00	3:		
516	5:37	7:	331	3:50	2:	359	2.50	2:	590	6.00	4:	531	8.00	2:	513	4.50	2:	364	2.00	5:		
470	2.00	3:																				
LIST	61																					
415	1:00	13:	516	7:25	4:	550	6:00	2:	584	4:33	3:	377	4:00	2:	447	3:00	2:	318	7:00	2:		
525	6:00	3:	445	3:50	5:	574	8:17	3:	546	3:00	4:	607	3:40	5:	568	9:50	5:	584	8:38	5:		
444	4:67	3:	297	5:50	6:	574	6:40	3:	467	8:33	3:	543	9:00	2:	647	13:50	5:	564	8:00	3:		
419	4:58	2:	479	3:50	3:	529	7:58	3:	441	10.00	2:	469	7.00	2:	514	13.00	2:	628	4.00	3:		
342	4:00	2:	627	9:00	2:	558	7:00	2:														
LIST	62																					
470	1:00	13:	318	1:27	11:	441	4:33	6:	371	3:75	4:	324	3:73	11:	302	8:50	3:	609	8:00	3:		
514	4:30	3:	346	4:50	2:	243	6:00	6:	560	3:67	3:	567	3:56	2:	382	8:89	3:	287	9:00	3:		
605	3.00	2:	415	2.50	2:	615	7.00	3:														



Pooled response word code (see APPENDIX E) in final ranked order.

Rank value used in computing RC value (see APPENDIX G). The value of 39.000 was assigned to the key stimulus word under the assumption that it is the first word given by all the quality control specialists. Thirty-eight (38) was the longest pooled response list (two (2) or more common responses) given by the specialists (38 + 1 = 39).

Rank order based on average response rank.

Values resulted from multiplying the frequency of response by 16 - average rank. Sixteen (16) was the longest list given by a single respondent to any key stimulus word. Actually, the longest list was fifteen (15) plus one (1) for the key stimulus word ((16 - 2.130) 8 = 110.960).

APPENDIX F (Continued)

```
LIST   55

 208.000      1.000     39.000     443
  56.000      2.000     38.000     446
 142.000      3.000     37.000     260
  24.000      4.500     36.000     441
  19.000      5.000     35.000     644
  85.020      6.000     34.000     532
  27.000      7.000     33.000     318
  31.000      8.000     32.000     590
  24.000      9.000     30.500     363
  25.000     10.000     30.500     373
  33.000     11.000     29.000     266
  35.010     12.000     28.000     254
```

```
37.00 36.00 27.50
41.00 30.00 30.00
RC =       .149277 FOR LISTS    2 AND   37

34.00
39.00
RC =       .059594 FOR LISTS    2 AND   38

37.00 36.00 34.00 27.50
32.00 21.00 23.50 35.00
RC =       .196615 FOR LISTS    2 AND   39

34.00 31.00 27.50 26.00
32.00 30.00 20.50 38.00
RC =       .176920 FOR LISTS    2 AND   40

37.00 36.00 34.00
29.50 32.00 37.00
RC =       .170481 FOR LISTS    2 AND   41

34.00
34.00
RC =       .056283 FOR LISTS    2 AND   42

26.00
32.50
RC =       .041141 FOR LISTS    2 AND   43

37.00 36.00 27.50 26.00
28.00 34.00 33.00 35.00
RC =       .198525 FOR LISTS    2 AND   44

34.00 31.00 29.00
34.00 25.50 31.00
RC =       .191725 FOR LISTS    2 AND   45

36.00 27.50
26.50 34.00
RC =       .091971 FOR LISTS    2 AND   46

37.00 36.00 33.00 29.00
31.00 30.00 39.00 35.00
RC =       .217586 FOR LISTS    2 AND   47

34.00 27.50 26.00
32.00 36.00 30.00
RC =       .144944 FOR LISTS    2 AND   48

36.50
45.00
RC =       .061347 FOR LISTS    2 AND   49

27.50
33.50
RC =       .044854 FOR LISTS    2 AND   50

38.00 36.00
30.00 31.00
RC =       .109840 FOR LISTS    2 AND   51

31.00 27.50 26.00
28.00 22.00 32.00
RC =       .127319 FOR LISTS    2 AND   52

38.00 37.00 36.00 34.00 30.00 29.00
35.00 25.00 37.00 38.00 34.00 36.00
RC =       .345440 FOR LISTS    2 AND   53

RC =       .000000 FOR LISTS    2 AND   54

38.00 34.00
29.00 36.00
RC =       .113248 FOR LISTS    2 AND   55

RC =       .000000 FOR LISTS    2 AND   56
```


See APPENDICES D and G for RC calculation example.

APPENDIX G

DEFINITION OF (RC) RELATEDNESS COEFFICIENT

The Relatedness Coefficient (RC) is defined as the amount of observed overlap to the maximum possible overlap between two rank order, free association response distributions.

$$RC = \frac{\bar{A} \cdot \bar{B}}{(A \cdot B) - 1}$$

The product $(A \cdot B)$ represents the intersect which would be obtained if every element in A appeared in B (and B in A) and in the same order. A and B are operationally defined by the product sum of the longest rank ordered response distribution of the two stimulus words. Where the two stimulus words are different, a minus one (-1) is used in the denominator to represent an unbiased estimate of maximum overlap. The product $\bar{A} \cdot \bar{B}$ is the product sum of the rank orders of response commonalities observed between two response distributions.

Example

COMPUTATION OF A SAMPLE RC FOR THE STIMULUS WORDS MEDIAN AND LCL

Associates to "Median"	Frequency	Rank	Associates to "LCL"	Frequency	Rank
Mean	4	36	Chart	10	38
Chart	2	29	Mean	5	34

A = Rank order of responses to "Median". (39, 38, ..., 1)
B = Rank order of responses to "LCL". (39, 38, ..., 1)
C = Common Responses. (Median, LCL)
$\bar{A}$ = (36, 29)
$\bar{B}$ = (34, 38)

$$RC = \frac{\bar{A} \cdot \bar{B}}{(A \cdot B) - 1} = \frac{(36, 29) \cdot (34, 38)}{(39, 38, \ldots, 1) \cdot (39, 38, \ldots, 1) - 1} = \frac{2,326}{(20,540 - 1)} = .113$$

APPENDIX H

Factor Analysis

Wherry-Wherry Hierarchical Rotation

General Format

Job ID Cards (2 - include time estimate, IB Job)
Program
Edit Card (1) (Control card)
Title Card (optional)
Variable Format
Edit Card (2) (Specify number of subjects, 1st 4 columns)
e.g. 0065
Data
End Cards

Edit Card (1) Setup

Col.	Information	Code System
1-3	No. of variables	122
4-6	Form of Data	Raw Data - 001 Correlation - 002 Varimax loading - 003
7-9	No. of Factors Desired	Note: $\frac{\text{No. of Var.'s}}{2}$ = max.
10-12	Minimum residual to continue	Note: $1/\sqrt{\text{No. of Subjects}}$ No Decimal: .123 = 123
13-15	Minimum residual for higher order factors	Note: Suggest .001 = 001
16-18	Minimum eiger value	Note: Suggest .100 = 100
19-21	Is there a second problem	No = 000 Yes = 001
22	Do and Print Correlation Matrix	No = 0 Yes = 1
23	Do and Print Varimax Loadings	No = 0 Yes = 1
24	Stop after Correlation Matrix	Stop = 0 Go = 1
25	Stop after Varimax Loadings	Stop = 0 Go = 1
26	Do you have a title	No = 0 Yes = 1
27	Do you have a variable Format Card	No = 0 Yes = 1
	Note: Only one VF Card is allowed.	

Note: 1. If Data is correlation coefficients
a. Put in correlation matrix
b. Format: 12F6.4 (No decimal point is needed)
2. If Data is varimax loadings
a. Maximum of 61 Factors
b. Format 12F6.4

Title Card

Col.	Information
1	Necessary
2072	Any alphabetic title

VARIABLE FORMAT CARDS

Must use 4 cards

Col.	Information
	1. Use only columns 1-72 on each card
	2. Must be in F Format beginning in Column 1 of first card and continuing through end of format statement, not exceeding 4 cards, using blank cards if necessary.

End Cards

One card for each data card per respondent
The First Card must have -99 in the first three columns.
Any succeeding card is blank

e.g. 2 cards per respondent = -99
blank

3 cards per respondent = -99
blank
blank

```
$RUN   AF123C,21456,37824886[illegible],999/9999   .JOHN NEE, INDUSTRIAL EDUCATION
$LOG   JOHN NEE, INDUSTRIAL EDUCATION - CREATIVE ENDEAVOR
$ASG,A  NEE.

$FOR,N  NEE.FACTORNEWDIM,DIM
FOR 00E2-05/24/77-15:49:22 (0,)


   STORAGE USED: CODE(1) 006156; DATA(0) 126425; BLANK COMMON(2) 000000

      END OF COMPILATION:         NO  DIAGNOSTICS.

$EXIT
MAP2591 RL71-3 05/24/77 15:50:07

ADDRESS LIMITS    001000 021125      8278 ISBANK WORDS DECIMAL
                  040000 172441     46370 BBANK WORDS DECIMAL
STARTING ADDRESS  012750


            SEGMENT $MAIN$          001000 021125     040000 172441

NWEF$/FOR                $(1)    001000 001205     $(2)   040000 040017
NRPLK$/FOR               $(1)    001206 001270
NPRCV$/FOR               $(1)    001271 001341     $(2)   040020 040075
NFTV$/FOR                $(1)    001342 001404
NFNXT$/FOR               $(1)    001405 001426     $(2)   040076 040172
NCLOSF/FOR               $(1)    001627 002064     $(2)   040173 040220
NOPEN$/FOR                                         $(2)   040221 042446
NFTCH$/FOR               $(1)    002065 002347     $(2)   042447 042462
NSAVE$/FOR               $(1)    002350 002374
NRSRL$/FOR               $(1)    002375 002431
NWORK$/FOR               $(1)    002432 002465
NOTIM$/FOR               $(1)    002466 002742     $(2)   042463 042466
NOUT$/FOR                $(1)    002743 004477     $(2)   042467 042530
NWRLK$/FOR               $(1)    004500 004611
NICER$/FOR               $(1)    004612 005031     $(2)   042531 042700
NINIT$/FOR               $(1)    005032 005240     $(2)   042701 042706
NINPT$/FOR               $(1)    005261 006657     $(2)   042707 042742
NFMT$/FOR                $(1)    006660 007542     $(2)   042743 043017
NFCHK$/FOR               $(1)    007543 010534     $(2)   043020 043170
                         $(3)    010535 010535     $(4)   043171 043242
NTABS/FOR                                          $(2)   043243 043301
FORCOM$/FOR                                        $(2)   043302 043307
ERRUS/SYSLIB
NERCOM$/FOR              $(1)    010536 010615     $(2)   043310 043323
FORCOM3/FOR                                        $(2)   043324 043333
NSTOP$/FOR               $(1)    010616 010640     $(2)   043334 043343
NFIXP$/FOR               $(1)    010641 011106     $(2)   043344 043427
NFOUT$/FOR               $(1)    011107 011726     $(2)   043430 043451
NCHUF$/FOR               $(1)    011727 011747
SORTS/FOR                $(1)    011750 012030     $(2)   043452 043463
NERR$/FOR                $(1)    012031 012372     $(2)   043464 043643
NRAND$/FOR               $(1)    012373 012456     $(2)   043644 043655
NIER$/FOR                $(1)    012457 012634     $(2)   043656 043775
NERUF$/FOR               $(1)    012635 012674     $(2)   043776 043776
NINTR$/FOR               $(1)    012675 012747     $(2)   043777 044014
BLANK#COMMON(COMMONBLOCK)
DI-                      $(1)    012750 021125     $(0)   044015 172441
                                                   $(2)   BLANK$COMMON

SYS$*LIB*. LEVEL 71-3
END MAP
```

APPENDIX H (Continued)

APPENDIX B (Continued)

RESIDUAL DISTRIBUTION
LOWER LIMIT FREQUENCY
JOHN DEE, INDUSTRIAL EDUCATION - CREATIVE ENDEAVOR - 21456

VARIMAX LOADINGS
JOHN SEE, INDUSTRIAL EDUCATION - CREATIVE ENDEAVOR - 21455

VAR	1	2	3	4	5	6
1	.2253	-.1256	.1601	.6100	.1502	.6879
2	.2707	-.1351	-.1944	.3125	.0788	.2602
3	.2707	-.1156	-.1405	.2561	.2180	.2404
4	.2707	-.1156	-.1405	.2242	.3933	.2851
5	.2707	-.1156	-.1405	.1758	.2749	-.0300
6	.2707	-.1156	-.1405	.1758	.2749	-.0300
7	.2707	-.1156	-.1405	.1758	.2749	-.0300
8	.2707	-.1156	-.1405	.1758	.2749	-.0300
9	.2707	-.1156	-.1405	.1758	.2749	-.0300
10	.2707	-.1156	-.1405	.1758	.2749	-.0300
11	.2707	-.1156	-.1405	.1758	.2749	-.0300
12	.2707	-.1156	-.1405	.1758	.2749	-.0300
13	.2707	-.1156	-.1405	.1758	.2749	-.0300
14	.2707	-.1156	-.1405	.1758	.2749	-.0300
15	.2707	-.1156	-.1405	.1758	.2749	-.0300
16	.2707	-.1156	-.1405	.1758	.2749	-.0300
17	.2707	-.1156	-.1405	.1758	.2749	-.0300
18	.2707	-.1156	-.1405	.1758	.2749	-.0300
19	.2707	-.1156	-.1405	.1758	.2749	-.0300
20	.2707	-.1156	-.1405	.1758	.2749	-.0300
21	.2707	-.1156	-.1405	.1758	.2749	-.0300
22	.2707	-.1156	-.1405	.1758	.2749	-.0300
23	.2707	-.1156	-.1405	.1758	.2749	-.0300
24	.2707	-.1156	-.1405	.1758	.2749	-.0300
25	.2707	-.1156	-.1405	.1758	.2749	-.0300
26	.2707	-.1156	-.1405	.1758	.2749	-.0300
27	.2707	-.1156	-.1405	.1758	.2749	-.0300
28	.2707	-.1156	-.1405	.1758	.2749	-.0300
29	.2707	-.1156	-.1405	.1758	.2749	-.0300
30	.2707	-.1156	-.1405	.1758	.2749	-.0300
31	.2707	-.1156	-.1405	.1758	.2749	-.0300
32	.2707	-.1156	-.1405	.1758	.2749	-.0300
33	.2707	-.1156	-.1405	.1758	.2749	-.0300
34	.2707	-.1156	-.1405	.1758	.2749	-.0300
35	.2707	-.1156	-.1405	.1758	.2749	-.0300
36	.2707	-.1156	-.1405	.1758	.2749	-.0300
37	.2707	-.1156	-.1405	.1758	.2749	-.0300
38	.2707	-.1156	-.1405	.1758	.2749	-.0300
39	.2707	-.1156	-.1405	.1758	.2749	-.0300
40	.2707	-.1156	-.1405	.1758	.2749	-.0300
41	.2707	-.1156	-.1405	.1758	.2749	-.0300
42	.2707	-.1156	-.1405	.1758	.2749	-.0300
43	.2707	-.1156	-.1405	.1758	.2749	-.0300
44	.2707	-.1156	-.1405	.1758	.2749	-.0300
45	.2707	-.1156	-.1405	.1758	.2749	-.0300
46	.2707	-.1156	-.1405	.1758	.2749	-.0300
47	.2707	-.1156	-.1405	.1758	.2749	-.0300
48	.2707	-.1156	-.1405	.1758	.2749	-.0300
49	.2707	-.1156	-.1405	.1758	.2749	-.0300
50	.2707	-.1156	-.1405	.1758	.2749	-.0300
51	.2707	-.1156	-.1405	.1758	.2749	-.0300
52	.2707	-.1156	-.1405	.1758	.2749	-.0300
53	.2707	-.1156	-.1405	.1758	.2749	-.0300
54	.2707	-.1156	-.1405	.1758	.2749	-.0300
55	.2707	-.1156	-.1405	.1758	.2749	-.0300
56	.2707	-.1156	-.1405	.1758	.2749	-.0300
57	.2707	-.1156	-.1405	.1758	.2749	-.0300
58	.2707	-.1156	-.1405	.1758	.2749	-.0300
59	.2707	-.1156	-.1405	.1758	.2749	-.0300
60	.2707	-.1156	-.1405	.1758	.2749	-.0300
61	.2707	-.1156	-.1405	.1758	.2749	-.0300
62	.2707	-.1156	-.1405	.1758	.2749	-.0300
63	.2707	-.1156	-.1405	.1758	.2749	-.0300
64	.2707	-.1156	-.1405	.1758	.2749	-.0300
65	.2707	-.1156	-.1405	.1758	.2749	-.0300
66	.2707	-.1156	-.1405	.1758	.2749	-.0300
67	.2707	-.1156	-.1405	.1758	.2749	-.0300
68	.2707	-.1156	-.1405	.1758	.2749	-.0300
69	.2707	-.1156	-.1405	.1758	.2749	-.0300
70	.2707	-.1156	-.1405	.1758	.2749	-.0300
71	.2707	-.1156	-.1405	.1758	.2749	-.0300
72	.2707	-.1156	-.1405	.1758	.2749	-.0300

APPENDIX H (Continued)

73	.0330	.1643	.1035	.1333	.0077	.0162
74	.4714	.0650	.0218	.0272	.1272	.0162
75	.0697	.1665	.2109	.3370	.4745	.0162
76	.0697	.0729	.0218	.0675	.0560	.0162
77	.0697	.0729	.0218	.0675	.0560	.0162
78	.0697	.0729	.0218	.0675	.0560	.0162
79	.0697	.0729	.0218	.0675	.0560	.0162
80	.0697	.0729	.0218	.0675	.0560	.0162
81	.0697	.0729	.0218	.0675	.0560	.0162
82	.0697	.0729	.0218	.0675	.0560	.0162
83	.0697	.0729	.0218	.0675	.0560	.0162
84	.0697	.0729	.0218	.0675	.0560	.0162
85	.0697	.0729	.0218	.0675	.0560	.0162
86	.0697	.0729	.0218	.0675	.0560	.0162
87	.0697	.0729	.0218	.0675	.0560	.0162
88	.0697	.0729	.0218	.0675	.0560	.0162
89	.0697	.0729	.0218	.0675	.0560	.0162
90	.0697	.0729	.0218	.0675	.0560	.0162
91	.0697	.0729	.0218	.0675	.0560	.0162
92	.0697	.0729	.0218	.0675	.0560	.0162
93	.0697	.0729	.0218	.0675	.0560	.0162
94	.0697	.0729	.0218	.0675	.0560	.0162
95	.0697	.0729	.0218	.0675	.0560	.0162
96	.0697	.0729	.0218	.0675	.0560	.0162
97	.0697	.0729	.0218	.0675	.0560	.0162
98	.0697	.0729	.0218	.0675	.0560	.0162
99	.0697	.0729	.0218	.0675	.0560	.0162
100	.0697	.0729	.0218	.0675	.0560	.0162
101	.0697	.0729	.0218	.0675	.0560	.0162
102	.0697	.0729	.0218	.0675	.0560	.0162
103	.0697	.0729	.0218	.0675	.0560	.0162
104	.0697	.0729	.0218	.0675	.0560	.0162
105	.0697	.0729	.0218	.0675	.0560	.0162
106	.0697	.0729	.0218	.0675	.0560	.0162
107	.0697	.0729	.0218	.0675	.0560	.0162
108	.0697	.0729	.0218	.0675	.0560	.0162
109	.0697	.0729	.0218	.0675	.0560	.0162
110	.0697	.0729	.0218	.0675	.0560	.0162
111	.0697	.0729	.0218	.0675	.0560	.0162
112	.0697	.0729	.0218	.0675	.0560	.0162
113	.0697	.0729	.0218	.0675	.0560	.0162
114	.0697	.0729	.0218	.0675	.0560	.0162
115	.0697	.0729	.0218	.0675	.0560	.0162
116	.0697	.0729	.0218	.0675	.0560	.0162
117	.0697	.0729	.0218	.0675	.0560	.0162
118	.0697	.0729	.0218	.0675	.0560	.0162
119	.0697	.0729	.0218	.0675	.0560	.0162
120	.0697	.0729	.0218	.0675	.0560	.0162
121	.0697	.0729	.0218	.0675	.0560	.0162
122	.0697	.0729	.0218	.0675	.0560	.0162

APPENDIX H (Continued)

HIGHER AND PRIMARY LOADINGS
JOHN NEE, INDUSTRIAL EDUCATION - CREATIVE ENDEAVOR - 21456

VAR	101	102	103	1	2	3	4	5	6
1	-.1219	.5719	-.2129	.0852	-.0222	-.0501	.6975	.1171	.0481
2	-.1649	.4162	-.0044	.2461	-.0265	-.2231	.5171	.0469	.0144
3	-.1635	.4128	-.1224	.1941	-.0064	-.2370	.4619	.1419	.0081
4	-.2235	.3626	-.1068	.0110	-.0009	-.1743	.3122	.2057	.0217
5	-.1436	.4211	-.0855	.1771	-.0009	-.1715	.4615	.1715	.0274
6	-.1500	.4446	-.0777	.1446	-.0064	-.0546	.4500	.1059	.0246
7	-.1200	.4366	-.0777	.1577	-.0064	-.2419	.4370	.1694	.0402
8	-.1120	.4366	-.2103	-.3557	-.0064	-.0470	-.0143	.2174	.0142
9	-.1120	.4366	-.2103	-.3557	-.0064	-.0470	-.0143	.2174	.0142
10	-.1602	.3712	-.2293	-.1288	-.0014	-.2629	.0619	.0548	.0155
11	-.2555	.1468	-.1221	-.0651	-.0029	-.2857	.2216	.0995	.0220
12	-.1424	.4249	-.0556	.1542	-.0064	-.2219	.2889	.2554	.0451
13	-.1746	.4257	-.0556	.1777	-.0064	-.1456	.1521	.0971	.0344
14	-.1746	.4257	-.1141	-.1167	-.0064	-.2233	.1101	.0769	.0111
15	-.1746	.4257	-.0701	.1277	-.0064	-.1694	.0589	.0555	.0178
16	-.1746	.4257	-.1465	-.0221	-.0064	-.1103	-.0784	.0204	.0051
17	-.1746	.4257	-.0666	-.0181	-.0064	-.1744	-.0784	.1605	.0347
18	-.1746	.4257	-.1335	-.1450	-.0064	-.0997	.1968	.2288	.0478
19	-.1746	.4257	-.1529	-.0654	-.0064	-.2149	.2231	.1193	.0152
20	-.1746	.4257	-.2210	-.1167	-.0064	-.0090	-.0116	.1897	.0039
21	-.1746	.4257	-.4437	-.0033	-.0064	-.1870	.1362	.1026	.0474
22	-.2175	.4257	-.2280	-.0655	-.0064	-.1314	.1445	.1496	.0264
23	-.4702	.4257	-.4642	-.0320	-.0064	-.2543	-.2106	.0951	.0914
24	-.4702	.4257	-.2268	-.0655	-.0064	-.3542	.1553	.0188	.0199
25	-.4702	.4257	-.2268	-.0375	-.0064	-.3542	-.1797	.0912	.0776
26	-.4702	.4257	-.1455	-.0244	-.0064	-.0412	.1966	.1365	.0226
27	-.4702	.4257	-.1712	-.0714	-.0064	-.0209	-.0205	.2284	.0114
28	-.4702	.4257	-.2668	-.0262	-.0064	-.0557	-.0771	.0791	.0292
29	-.4702	.4257	-.2095	-.0405	-.0064	-.0411	-.0737	.0661	.0273
30	-.4702	.4257	-.3191	-.1446	-.0064	-.2262	-.0606	.0225	.0142
31	-.4702	.4257	-.2731	-.0117	-.0064	-.1751	-.1814	-.0030	.0225
32	-.4702	.4257	-.2211	-.0731	-.0064	-.0619	-.1814	-.0296	.0347
33	-.4702	.4257	-.4117	-.1587	-.0064	-.1659	-.1430	-.0723	.0572
34	-.4702	.4257	-.1554	-.0576	-.0064	-.0007	-.0622	.1419	.0401
35	-.4702	.4257	-.3040	-.0455	-.0064	-.0356	-.0622	-.0444	.0217
36	-.4702	.4257	-.2740	-.0403	-.0064	-.0356	-.0622	.1316	.0136
37	-.4702	.4257	-.2771	-.1107	-.0064	-.0945	-.0457	.1490	.0365
38	-.4702	.4257	-.1155	-.0107	-.0064	-.0743	-.0717	.0654	.0222
39	-.4702	.4257	-.0485	-.0101	-.0064	-.1196	-.0708	.0662	.0111
40	-.4702	.4257	-.2574	-.1574	-.0064	-.0115	-.0588	-.0268	.0126
41	-.4702	.4257	-.1179	-.1428	-.0064	-.0275	-.1503	-.2284	.0358
42	-.4702	.4257	-.1212	-.0668	-.0064	-.0174	-.1503	.0774	.0198
43	-.4702	.4257	-.0912	-.0668	-.0064	-.0174	-.0728	.0617	.0198
44	-.4702	.4257	-.1757	-.1057	-.0064	-.1109	-.1284	-.0899	.0124
45	-.4702	.4257	-.2156	-.0158	-.0064	-.0739	-.2198	-.1552	.0411
46	-.4702	.4257	-.2990	-.1664	-.0064	-.0627	-.2198	-.0589	.0294
47	-.4702	.4257	-.2269	-.0697	-.0064	-.1029	-.2198	-.0579	.0294
48	-.4702	.4257	-.1734	-.0621	-.0064	-.1057	-.1695	-.0444	.0294
49	-.4702	.4257	-.1735	-.0614	-.0064	-.2342	-.1695	-.0444	.0294
50	-.4702	.4257	-.0614	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
51	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
52	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
53	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
54	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
55	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
56	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
57	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
58	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
59	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
60	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
61	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
62	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
63	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
64	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
65	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
66	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
67	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
68	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
69	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
70	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
71	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294
72	-.4702	.4257	-.1349	-.0614	-.0064	-.0565	-.1695	-.0444	.0294

APPENDIX H (Continued)

APPENDIX H (Continued)